Phase 1 Intermediate Design Report
Hudson River PCBs Superfund Site

Attachment A – Phase 1 Intermediate Design Remedial Action Monitoring Plan Scope

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Attachment A - Phase 1 Intermediate Design

Remedial Action Monitoring Scope

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1. Introduction

This *Phase 1 Intermediate Design Remedial Action Monitoring Scope* (Phase 1 ID RA Monitoring Scope [Attachment A]) describes the environmental monitoring program that General Electric Company (GE) will carry out during the performance of Phase 1 of the Remedial Action (RA) for the Upper Hudson River to implement, and assess attainment of the criteria set forth in, the Engineering Performance Standards (EPS), the Quality of Life Performance Standards (QoLPS), and substantive water quality requirements (WQ requirements) issued by the United States Environmental Protection Agency (EPA) for Phase 1. The EPS consists of: 1) the Resuspension Performance Standard, 2) the Residuals Performance Standard, and 3) the Productivity Performance Standard, and are set out in a five-volume document titled *Hudson River PCBs Superfund Site Engineering Performance Standards (Hudson EPS)*, issued by EPA in April 2004 (EPA, 2004a).

The QoLPS consist of performance standards governing: 1) air quality, 2) odor, 3) noise, 4) lighting, and 5) navigation, and are set out in a document titled *Hudson River PCBs Superfund Site Quality of Life Performance Standards (Hudson QoLPS)*, issued by EPA in May 2004 (EPA, 2004b).

The WQ requirements consist of: 1) requirements relating to in-river releases of constituents not subject to EPS, as set forth in *Substantive Requirements Applicable to Releases of Constituents not Subject to Performance Standards*; 2) the substantive requirements for discharges to the Hudson River and Champlain Canal, as set forth in *Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to Champlain Canal (land cut above Lock 7)*; and 3) *Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharge to the Hudson River*. These three sets of requirements are contained in a single document in the form of a letter to GE with enclosures that EPA issued on January 7, 2005.

This Phase 1 ID RA Monitoring Scope will form the basis for the *Phase 1Environmental Monitoring Plan* (Phase 1 EMP), which will accompany the *Phase 1 Final Design Report* (Phase 1 FDR), and the *Phase 1 Remedial Action Monitoring Quality Assurance Project Plan* (Phase 1 RAM QAPP) to be prepared in accordance with Section 4 of the *Phase 1 Intermediate Design Report* (Phase 1 IDR). The Phase 1 EMP and Phase 1 RAM QAPP will be consistent with this Phase 1 ID RA Monitoring Scope.

This Phase 1 ID RA Monitoring Scope will also form the basis for the Phase 2 EMP to be submitted in conjunction with the *Phase 2 Final Design Report*.

This Phase 1 ID RA Monitoring Scope is organized to cover each of the following major data acquisition programs:

- Water column and fish monitoring;
- Sediment residuals monitoring;
- Air quality and odor monitoring;
- Noise monitoring;
- Lighting monitoring;
- Water discharge monitoring; and
- Special studies.

Collectively, this monitoring program will be referred to as the Remedial Action Monitoring Program (RAMP). The RAMP will replace the Baseline Monitoring Program (BMP; QEA, 2003; QEA and ESI, 2004) during the RA.

The RAMP will not address the standard for navigation, which is included in the QoLPS, since no environmental monitoring requirements pertain to the navigation standard. The activities relating to implementation of the navigation standard will be described in detail in the design documents, the *Remedial Action Community Health and Safety Plan* (Phase 1 RA CHASP), and the *Phase 1 Performance Standards Compliance Plan* (Phase 1 PSCP) to be provided as part of the *Remedial Action Work Plan for Phase 1 Dredging and Facility Operations* (Phase 1 RA Work Plan). Scopes for the Phase 1 RA CHASP and the Phase 1 PSCP are attached to the Phase 1 IDR as Attachments B and C, respectively.

2. Water Column and Fish Monitoring

This section describes the Water Column Monitoring Program that will be carried out in Phase 1 of the Remedial Action to implement the Engineering Performance Standard for Dredging Resuspension (the Resuspension Standard) and the WQ requirements for in-river releases of constituents not subject to performance standards. This section also describes the Fish Monitoring Program that will be performed during Phase 1 of the Remedial Action.

2.1 Objectives, Criteria, and Parameters Subject to Monitoring

2.1.1 Resuspension Standard

The objectives of the Resuspension Standard (as stated in *Hudson EPS*, Volume 1, p. 37) are to:

- Maintain polychlorinated biphenyl (PCB) concentrations in the water column at or below the federal drinking water Maximum Contaminant Level (MCL) of 500 ng/L to protect downstream municipal intakes;

- Minimize the release of PCBs from sediment during remedial dredging; and

- Minimize the export of PCBs to downstream areas, including the Lower Hudson.

The EPA has designated threshold criteria to trigger contingency monitoring and engineering evaluation and controls to reduce the release of PCBs from dredge areas so that the objectives are met. There are three levels of such criteria – known as the Evaluation Level, Control Level, and Resuspension Standard Threshold Level (the Standard Level). These criteria are applied at near-field stations, located within 300 meters (m) of the dredging activities, and at far-field stations, located more than 1 mile downstream of the dredging activity. The applicable criteria are summarized in Table 2-1 of Volume 1 of the EPS and are as follows (specified separately for near-field and far-field stations):

Near-Field Criteria

Evaluation Level

Under the *Hudson EPS* (Section 4.1.1 Volume 2, pp. 87-92), the Evaluation Level would be exceeded if any of the following conditions occurs:

- "The sustained suspended solids concentration above ambient conditions at a location 300 m downstream (i.e., near-field monitoring) of the dredging operation or 150 m downstream from any suspended solids control measure (e.g., silt curtain) exceeds 100 mg/L for River Sections 1 and 3 and 60 mg/L for River Section 2. To exceed this criterion, this condition must exist on average for six hours or for the daily dredging period (whichever is shorter). Suspended solids are measured continuously by surrogate or every three hours by discrete samples."

- "The sustained suspended solids concentration above ambient conditions at the near-field side channel station or the 100 m downstream station exceeds 700 mg/L. To exceed this criterion, this condition must exist for more than three hours on average measured continuously or a confirmed occurrence of a concentration greater than 700 mg/L when suspended solids are measured every three hours by discrete samples."

Control Level

Under the *Hudson EPS* (Section 4.1.2 Volume 2, pp. 93-95), the Control Level would be exceeded if any of the following conditions occurs:

- "The sustained suspended solids concentration above ambient conditions at a location 300 meters downstream (i.e., near-field monitoring) of the dredging operation or 150 meters downstream from any suspended solids control measure (e.g., silt curtain) exceeds 100 mg/L for River Sections 1 and 3 and 60 mg/L for River Section 2. To exceed this criterion, this condition must exist for a period corresponding to the daily dredging period (6 hours or longer) or 24 hours if the operation runs continuously (whichever is shorter) on average. Suspended solids are measured continuously by surrogate or every three hours by discrete samples."

Far-Field Criteria

Evaluation Level

Under the *Hudson EPS* (Section 4.1.1 Volume 2, pp. 87-92), the Evaluation Level would be exceeded if any of the following conditions occurs:

- "The net increase in Total PCB mass transport due to dredging-related activities at any downstream far-field monitoring station exceeds 300 g/day for a seven-day running average."

- "The net increase in Tri+ PCB mass transport due to dredging-related activities at any downstream far-field monitoring station exceeds 100 g/day for a seven-day running average."

- "The sustained suspended solids concentration above ambient conditions at a far-field station exceeds 12 mg/L. To exceed this criterion, this condition must exist on average for 6 hours or a period corresponding to the daily dredging period (whichever is shorter). Suspended solids are measured continuously by turbidity (or an alternate surrogate) or every three hours by discrete samples."

Control Level

Under the *Hudson EPS* (Section 4.1.2 Volume 2, pp. 93-95), the Control Level would be exceeded if any of the following conditions occurs:

- "The Total PCB concentration during dredging-related activities at any downstream far-field monitoring station exceeds 350 ng/L for a seven-day running average."

- "The net increase in Total PCB mass transport due to dredging-related activities at any downstream far-field monitoring station exceeds 600 g/day on average over a seven-day period."

- "The net increase in Tri+ PCB mass transport due to dredging-related activities at any downstream far-field monitoring station exceeds 200 g/day on average over a seven-day period."

- ""The net increase in PCB mass transport due to dredging-related activities measured at the downstream far-field monitoring stations exceeds 65 kg/year Total PCBs or 22 kg/year Tri+ PCBs."

- "The sustained suspended solids concentration above ambient conditions at a far-field station exceeds 24 mg/L. To exceed this criterion, this condition must exist for a period corresponding to the daily dredging period (six hours or longer) or 24 hours if the operation runs continuously (whichever is shorter) on average. Suspended solids are measured continuously by surrogate or every three hours by discrete samples."

<u>Standard Level</u>

Under the *Hudson EPS* (Section 4.1.3 Volume 2, p. 98), the Standard Level is "a confirmed occurrence of 500 ng/L Total PCBs, measured at any main stem far-field station. To exceed the standard threshold, an initial result greater than or equal to 500 ng/L Total PCBs must be confirmed by the average concentration of four samples collected within 48 hours of the first sample. The standard threshold does not apply to far-field station measurements if the station is within one mile of the remediation."

2.1.2 WQ Requirements

The EPA, in consultation with the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH), has specified water quality standards for a number of constituents that are not subject to the EPS and that will be monitored for compliance during Phase 1 of the Remedial Action. The objectives of these WQ requirements are:

- Protection of aquatic species via Aquatic Acute standards;
- Protection of drinking water supplies via Health (Water Source) standards; and
- Protection of drinking water supplies via New York State Department of Health (NYSDOH) action levels.

Aquatic Acute Water Quality Standards at Near-Field Stations

The *WQC Substantive Requirements* (pp. 1 & 2) set forth the following standards for near-field stations:

- "Aquatic standards (some of which are hardness-dependent) apply to the dissolved form. Hardness varies along the length of the project area and will result in a range of calculated standards. For example, based on limited available data, average hardness values from Corinth and Waterford range from 18 ppm to 55 ppm respectively. The resulting ranges of water quality standards are as follows (where applicable, the formulas for calculating the standards are in brackets):

- cadmium – Aquatic Acute A(A): 0.6 µg/L to 2.0 µg/L [(0.85) exp(1.128[ln (ppm hardness)] – 3.6867)].
- lead – Aquatic Acute A(A): 14.4 µg/L to 50.4 µg/L [{1.46203 – [ln (hardness) (0.145712)]} exp (1.273 [ln (hardness)] – 1.052)].
- chromium – Aquatic Acute A(A): 140 µg/L to 349 µg/L [(0.316) exp (0.819 ln (ppm hardness)) + 3.7256)].
- chromium (hexavalent) – Aquatic Acute A(A): 16 µg/L.
- mercury – Aquatic Acute A(A): 1.4 µg/L."

- "Water quality standards for pH and dissolved oxygen are specified in NYCRR Title 6, Chapter X, Part 703.3.
  - pH will not be less than 6.5 or more than 8.5.
  - Dissolved oxygen for non-trout waters:
    - The minimum daily average will not be less than 5.0 mg/L.
    - At no time will the dissolved oxygen concentration be less than 4.0 mg/L."

Based on review of the historical data, routine monitoring for compliance with the foregoing Aquatic Acute standards for dissolved metals will be limited to analyses for dissolved cadmium and lead, with total cadmium and lead analyses performed as well. It is expected that the monitoring of lead and cadmium should adequately represent the metals associated with sediment resuspension. The EPA, GE, and NYSDEC will evaluate whether mercury and chromium concentrations are adequately represented by lead and cadmium concentrations based on the BMP data, Treatability Study data, any additional sediment data that become available, and/or water column data collected during Phase 1. Based on evaluation of these data, these monitoring requirements may be modified upon agreement of EPA (after consultation with NYSDEC) and GE. Analytical results will be reported for the entire target analyte list (TAL) of metals that are analyzed by EPA Method 200.8 (which exclude mercury and hexavalent chromium, which are analyzed by separate methods – see Section 2.4.4). As discussed further in Section 2.4.4, if monitoring indicates that the dissolved cadmium and/or lead concentrations exceed the above standards, samples will be collected and analyzed (in both dissolved and total form) for the entire suite of metals subject to the Aquatic Acute standards. If, during in-water activities, distressed or dying fish are observed, increased monitoring will be conducted for metals and additional water quality parameters, where appropriate, in accordance with the Phase 1 ID PSCP Scope (Section 7.5) and WQ Substantive Requirements (p.9).

Health (Water Source) Standards at Far-Field Stations

The *WQ Requirements* (p. 2) set forth the following Health (Water Source) standards for cadmium, chromium, and mercury and the following action level for lead. These standards and action levels are based on total form and are not hardness-dependent, and they are not to be exceeded at any of the Schuylerville, Stillwater, or Waterford far-field stations.

- Cadmium (total): 5.0 µg/L.
- Chromium (total): 50 µg/L.
- Mercury (total): 0.7 µg/L.
- Lead (total): 15.0 µg/L (NYSDOH action level).

In addition, the WQ requirements incorporate the NYSDOH's trigger level of 10 µg/L total lead for two far-field stations (Stillwater and Waterford) to protect water suppliers and the public, and state that if that trigger level is exceeded, certain notification and/or response actions must be taken, as described in the Phase 1 PSCP and its Phase 1 IDR Scope.

Determination of an exceedance of the above standards and action level requires a "confirmed occurrence" – i.e., four subsequent samples exceeding the standard/action level, each representing a 6-hour composite, as specified in the *WQ Substantive Requirements* (p. 7).

Based on review of the historical data, routine monitoring for compliance with the foregoing standards and action/trigger levels will be limited to analyses for total cadmium and lead, with dissolved cadmium and lead analyses performed as well. It is expected that the monitoring of lead and cadmium should adequately represent the metals associated with sediment resuspension. EPA, GE, and NYSDEC will evaluate whether mercury and chromium concentrations are adequately represented by lead and cadmium concentrations based on the BMP data, Treatability Study data, any additional sediment data that become available, and/or water column data collected during Phase 1. Based on evaluation of these data, these monitoring requirements may be modified upon agreement of EPA (after consultation with NYSDEC) and GE. Analytical results will be reported for all TAL metals that are analyzed by EPA Method 200.8 (i.e., excluding mercury and hexavalent chromium, which are analyzed by separate methods – see Section 2.4.4). As discussed further in Section 2.4.4, if monitoring indicates that the total cadmium concentration exceeds the cadmium standard or that the total lead concentration exceeds the lead action or trigger level, Samples will be collected and analyzed (in both dissolved and total form) for the entire suite of metals subject to the Health (Water Source) standards. If, during in-water activities, distressed or dying fish are observed, increased monitoring will be conducted for metals and additional water quality parameters, where appropriate, in accordance with the Phase 1 ID PSCP Scope (Section 7.5) and WQ Substantive Requirements (p.9).

2.2 Monitoring Locations and Frequency

Near-field and far-field monitoring locations will be sampled and frequency specified in the *Hudson EPS* Volume 2, Sections 4.2.4, 4.2.5 and 4.2.6, except for modifications approved by EPA and documented herein.

Monitoring will be required for at least the remedial operations listed below. Other operations related to dredging may be included as well (*Hudson EPS* Volume 2 p. 102):

- Dredging;
- Debris removal;
- Resuspension control equipment removal;
- Cap placement;
- Backfill placement;
- Installation of containment devices other than silt curtains (sheet piling and other structural devices requiring heavy equipment operation and disturbance of the river bottom); and
- Shoreline excavation and restoration.

The following remedial operation will not require near-field monitoring:

- Silt curtain placement; and
- Off loading to the processing facility.

2.2.1 Near-Field Monitoring

The locations specified in the *Hudson EPS* (Volume 2, Section 4.2.4.2) will be monitored. Near-field monitoring locations are associated with individual remedial operations and move as the operation moves. Each remedial operation requires five monitoring locations. The locations of the near-field stations are dictated by the near-field criteria. A single background station will be located about 100 m upstream of the dredging activity on the centerline of flow through the area of dredging activity to provide water quality data for the water entering the dredging area. To monitor for resuspension caused by workboats, a single station will be placed adjacent to the dredging activity, in the side channel downstream of the principal location of boat and barge activity supporting the dredging activity. The side channel station will be located reasonably close to workboat activity (approximately 10 m away from the dredging operation), subject to the safety procedures described in the project *Health and Safety Plan* (HASP) (BBL, 2003). Three stations will be placed downstream of the dredging operation in an approximately triangular distribution to provide reasonable assurance that a resuspension plume will not escape the near-field undetected. The station nearest the dredging activity (100 m downstream of the activity or 50 m downstream of the most exterior resuspension control system) will be located along the estimated centerline of flow from the dredging activity. This will be defined as a line beginning at the location of the dredge and running parallel to the centerline of flow. The two stations further downstream will be located to either side of the centerline along a cross-flow transect spaced as appropriate to monitor the plume. These stations will be located approximately 300 m downstream of the dredging operation or 150 m downstream of the most exterior downstream resuspension barrier. The location of the three downstream stations will be assessed daily to maintain their position relative to the centerline of flow through the dredging activities. A boat-mounted Acoustic Doppler Current Profiler (ADCP) or continuous turbidity probe will be used to assess the location of any observable plume to ensure that these downstream compliance stations are located within the plume. In the event that a dredging area is isolated by a resuspension control barrier, a sixth monitoring location will be added within the control barrier. The distances from the remedial operations are approximate and the location of the near-field stations may be changed in the field to better capture the plume, if EPA approves the change.

If remedial operations are located in close proximity to one another, it may not be feasible to maintain all of the locations since there may be safety concerns or the stations may be within the working area for another operation. In such cases, monitoring locations may need to be dropped. The requirements for reduction in the near-field monitoring locations will be followed, specified in the *Hudson EPS* Volume 2, Section 4.2.5. Decisions to drop locations must be documented in the weekly reports.

The near-field monitoring stations will consist of an easily movable device such as a buoy or a mobile platform (e.g., a small pontoon boat) that can be anchored in place. On-board instrumentation will include continuous water column monitoring probes, global positioning system (GPS), navigational lighting, radio communications, and their associated power sources. Additional equipment, such as automated sampling systems, meteorological stations, and other monitoring equipment, will be included on select near-field stations as necessary.

Near-field monitoring will be sufficiently frequent to detect a dredging release with a minimum duration of 1 hour (the minimum number of sub-samples will be identified in the Phase 1 RAM QAPP). To meet this requirement, continuous monitoring will be performed for dissolved oxygen (DO), conductivity, temperature, pH, and turbidity (or other surrogate) at all near-field stations. Each near-field station will have continuous monitoring for turbidity, temperature, and conductivity for one hour prior to beginning remedial operations and for at least two hours after the operation ceases (*Hudson EPS* Volume 2, page 116). This applies to the five stations required if there are no barriers installed and to all six stations if barriers are installed.

One total suspended solid (TSS) sample per station per day will be collected to confirm the surrogate relationship. The ability of the surrogate to adequately predict the suspended solids concentrations will be assessed on a daily basis. The criteria and method for assessing the surrogate relationship will be provided in the Phase 1 RAM QAPP and may differ from that provided in the *Hudson EPS* Volume 2 Section 4.4. If the turbidity (or other surrogate) measurements indicate that a TSS criterion has been exceeded, two TSS samples per day will be collected at the station with the exceedance until such time that the surrogate relationship is confirmed and the station is in compliance.

In the event that a suitable surrogate relationship is not sustainable, vertically-integrated samples will be collected every three hours and analyzed for suspended solids. One sample from each near-field station will be collected one-hour prior to beginning the remedial operations at a location. Corrective measures will be taken to update or change the surrogate relationship to bring it back within the performance metrics set in the Phase 1 RAM QAPP, which will be based on the results of the TSS surrogate study (QEA, 2005a). These measures may include the collection of laser particle size measurements (if applicable) and additional TSS samples, and the evaluation of the performance of automated sampling equipment (if used) and turbidity probes.

Depending on the results of the TSS Surrogate Study, discrete laser particle counters may be used for suspended solids analysis. At both the near-field and far-field stations, pH and DO will be monitored discretely each time a sample is collected (*Hudson EPS* Volume 2, p. 117).

WQ samples for hardness and dissolved and total metals will be collected from the upstream background station and the two stations located 300 m downstream of dredging operations if no resuspension barriers are used or approximately 150 m downstream if resuspension barriers are used. These samples will be collected using an automated sampling system (ISCO or equivalent) from a single, conservative monitoring depth (i.e., at ~ 75% of the water column depth or a minimum of 2 feet off the bottom), as described in Section 2.3.1. The vertical location of the intake may be adjusted based on information gathered during Phase 1. Sample aliquots will be collected at a frequency that is appropriate for the amount of sample required over the sampling period, consistent with the capabilities of the automated sampling equipment. Given that the representativeness of samples will increase as the frequency of collection of sample aliquots increases, the capabilities of the automated samplers will be assessed prior to Phase 1, and the highest sample collection frequency that can be practically achieved on a routine basis will be used. The aliquots from each station will be integrated to form a single daily composite sample for each of the three monitoring stations under routine monitoring. If an automated sampler fails, a minimum of two discrete samples will be collected per station per day and composited; these discrete samples will be depth-integrated using the BMP sampling protocol.

If either of the downstream stations exceeds the WQ Acute Aquatic criteria, the sampling frequency will increase to four aliquots per hour and four composite samples per day at each station and sufficient volume of water will be collected to analyze for total and dissolved metals. If an automated sampler fails while in exceedance, a minimum of four discrete samples will be collected per station per day; these discrete samples will be depth-integrated using the BMP sampling protocol. This sampling frequency will be maintained until such time as the station is in compliance and the EPA has authorized a return to routine monitoring. After the first month, the sampling results will be evaluated and modifications to the monitoring program may be made based on the results of such evaluation subject to EPA approval in consultation with the NYSDEC.

2.2.2 Far-Field Monitoring

The far-field stations will coincide with the stations established for the BMP, except where such stations need to be relocated to accommodate automated sampling. A correction may need to be applied to the baseline data to properly determine compliance with the load-based resuspension criteria. The correction factor will be developed during baseline based on additional data collection and analysis (GE's baseline automated sampler study). The far-field stations include a background station at Bakers Falls and the following five Upper Hudson River stations that will be used to assess achievement of the applicable far-field criteria:

- Rogers Island (River Mile [RM] 194.2);

- Thompson Island (RM 187.5);
- Schuylerville (RM 181.4);
- Stillwater (RM 168.4); and
- Waterford (RM 156.0).

Two additional far-field stations will be located in the Lower Hudson River at Albany (RM 140) and Poughkeepsie (RM 77). A third station at the Mohawk River at Cohoes, which has historically shown low levels of PCB, will be monitored every month; EPA has approved this deviation from the EPS (i.e., contingency monitoring is not required), however, EPA may require higher frequency sampling during Phase 1, if warranted, at the Mohawk River station (e.g., concentrations are greater on average than measured during baseline).

GE is constructing and operating an automated sampling station at Lock 5 (RM 182.3) in 2005 on a pilot basis in accordance with the EPA approved *Scope of Work for Pilot Studies for Automated Near- and Far-Field Water Column Sampling* (QEA, 2005b). This automated station will replace the Schuylerville BMP station after appropriate testing is completed, subject to EPA approval. Automated samplers will also be used at the four remaining Upper Hudson River far-field sampling stations. The precise locations of those automated sampling stations will be determined following completion of the pilot studies, and construction and validation of those stations will be performed in 2006. Each station has been or will be constructed such that water can be automatically sampled from a number of locations along a cross-sectional transect and water quality parameters can be monitored continuously. Once the pilot study has been completed and the other automated stations have been constructed and tested, and EPA has reviewed the test data and approved use of the stations for the BMP, automated sampling techniques will replace manual BMP sampling protocols at these far-field locations. However, the capability to perform manual sampling at the routine monitoring frequency specified in the Resuspension Standard will be maintained, using the BMP sampling protocols, in the event that an automated station fails or is off-line for maintenance.

Monitoring for assessment of the far-field criteria will be conducted at the each downstream far-field station that is a minimum of 1 mile away from the dredging activity. The Thompson Island station will be the nearest representative downstream far-field station for the entire Phase 1 dredging program because this program will terminate at about RM 189.8. The Thompson Island station will serve as a compliance check point for near-field exceedances of TSS at the Evaluation and Control Levels (*Hudson EPS* Volume 2 p. 117, "Exceedance of the Near-Field Resuspension Criteria").

In the event that dredging occurs in more than one river section, effectively creating two nearest far-field stations, this standard is applied in the same manner to both stations. That is, the far-field concentration criteria apply to both stations equally. Given the various uncertainties in load estimation, no pro-rating of the standard for the upper station will be required, although GE could consider doing so, as needed. This means that any of the far-field stations can dictate response actions. In the event that dredging operations move to a location less than one mile upstream of a far-field monitoring point, the next downstream far-field station becomes the representative far-field station for the operation. The nearer far-field station will continue to be monitored at the routine level, not to judge compliance with the standard, but rather to provide data to allow comparison of the far-field station to the new far-field compliance station.

In addition, continuous particle counter measurements may be acquired at these stations if it is determined during the course of the TSS surrogate study (QEA, 2005a) that this technology provides information that will be useful for compliance monitoring. GE will submit recommendations to EPA for the adoption or abandonment of this technology along with the results of the TSS surrogate study.

Rogers Island will serve as the upstream far-field station that will be used to assess PCB load contributions originating upstream of the remediation area. The statistical criteria for this assessment will utilize those described in the *Hudson EPS* (Volume 2, Section 4.1.4.3) and will be included in the Phase 1 PSCP and Phase 1 RAM QAPP.

To provide upstream data for application of some of the resuspension criteria, weekly background samples will be collected at Bakers Falls for PCB, TSS, dissolved organic carbon (DOC), and particulate organic carbon (POC) analysis. These samples will be collected using the manual BMP sampling protocol and discrete measurements of water quality parameters (turbidity, temperature, pH, conductivity and DO) will be taken at the time of sample collection. The sampling frequency at Bakers Falls may be reduced to monthly, with EPA's approval, if the analysis of BMP sampling results indicates that this station has uniformly low PCB concentrations. Daily composite PCB, TSS, DOC, and POC samples will be collected at Rogers Island using the automated sampling system, with sample aliquots collected at a frequency that is appropriate for the amount of sample required over the sampling period, consistent with the capabilities of the automated sampling equipment, subject to EPA approval. Water quality parameters (turbidity, temperature, pH, and conductivity) will be monitored continuously at this station. DO will be measured along with each grab sample collected for suspended solids. A daily discrete sample will be collected for TSS for the purposes of confirming the TSS surrogate relationship. If it is determined that the surrogate relationship is not adequate, samples will be collected for suspended solids every 3 hours, 24 hours per day, with a maximum 24-hour turnaround time, but reasonable efforts will be utilized to reduce the 24-hour turnaround time. If manual sampling is conducted at Rogers Island due to a failure or maintenance of the automated sampling station, daily discrete samples will be collected using the manual BMP sampling protocol. As stated in the *Hudson EPS* (Volume 2, p. 112), the monitoring frequency at Rogers Island may be reduced to weekly, with EPA approval, for all parameters except TSS if the data will not be used to monitor for releases from upstream sources that could be interpreted as releases from the remediation.

Routine monitoring at each of the Thompson Island, Schuylerville, Stillwater, and Waterford stations will be conducted at a frequency sufficient (sub-sampling at once per half hour at a minimum) to verify that short-term (1 hour or more) elevated dredging-induced releases do not pass that far-field station undetected. To meet this requirement, continuous monitoring will be performed for DO, pH, conductivity, temperature, and turbidity. At the Thompson Island station, suspended solids will be continuously monitored with a turbidity monitor. TI Dam will have a surrogate relationship for suspended solids concentrations in place prior to Phase 1. A particle counter may also be used at the TI Dam station if it is determined during the TSS surrogate study that the technology provides useful data for compliance monitoring. If it is determined that the surrogate relationship does not provide a reasonable estimate of TSS, samples will be collected for suspended solids every 3 hours, 24 hours per day, with a maximum 24-hour turnaround time, but reasonable efforts will be utilized to reduce the 24-hour turnaround time. The turnaround time starts at sample receipt by the laboratory. Daily composite PCB, DOC, and POC samples will be collected at these stations under routine monitoring conditions. Modeling indicates that a 1-hour long dredging release that originates from the furthest downstream point of the Phase 1 areas in River Section 1 will result in elevating the concentrations of monitored parameters at the Thompson Island Station for several hours due to dispersion. Sample aliquots will be obtained at a frequency that is appropriate for the amount of sample required over the sampling period, consistent with the capabilities of the automated sampling equipment. Since the representativeness of samples will increase as the frequency of collection of sample aliquots increases, the capabilities of the automated samplers will be assessed prior to Phase 1, and the highest sample collection frequency that can be practically achieved on a routine basis will be used. These aliquots will be used to form 24-hour composites. This sampling frequency will ensure that multiple measurements will occur during the minimum release of interest. If manual sampling is conducted at Thompson Island or Schuylerville due to a failure or maintenance of the automated sampling station, the daily discrete sample will be collected with consideration of time of travel from dredging operations.

If the nearest representative down stream station exceeds the Evaluation Level criteria, the sampling frequency will increase to two 12-hour composite samples per day at Thompson Island and Schuylerville. If the compliance station exceeds the Control or Standard Level criteria, the sampling frequency will increase to three (8-hour) or four (6-hour) composite samples per day, respectively, at Thompson Island and Schuylerville. These increased sampling frequencies will be maintained until the stations are back in compliance as specified in Section 4.3 of the *Hudson EPS* (Reverting to Lower Action Levels) in some cases requiring EPA approval. If the Standard Level has been exceeded at the Thompson Island Dam station or Schuylerville station, the sample collection frequency at Stillwater and Waterford will increase to four composite samples per day and the appropriate, notification, and contingency measures will be implemented in accordance with the Phase 1 PSCP and Phase 1 RA CHASP.

The Lower Hudson River stations at Albany and Poughkeepsie will be sampled every four weeks (*Hudson EPS* Volume 2 p. 115) using the manual BMP sampling protocol (i.e., vertically-integrated sampling at a centroid location). (This low frequency is contingent on the results of the BMP showing Total PCB concentrations less than 100 ng/L on average to allow a margin of safety for the public water supplies [*Hudson EPS* Volume 2 p. 115]). If the 7-day running average total PCB concentration at Waterford or Troy is 350 ng/L (measured or estimated [*Hudson EPS* Volume 2, Section 4.2.6.4]) or greater (Control Level), the sampling frequency will be increased to weekly and maintained at that level until the conditions for reverting to routine monitoring are met as specified in Section 4.3 of the *Hudson EPS* (Reverting to Lower Action Levels). Samples for PCBs, DOC, POC, and suspended solids will be collected. Water quality parameters will be measured on each sample (turbidity, temperature, pH, conductivity, and DO). The results of the analyses will be required within 72 hours (*Hudson EPS* Volume 2, p. 115).

The Mohawk River station will be sampled once per other month from May through November to maintain the historical record; these samples will be collected manually from a centroid location and will be vertically integrated. If the PCB concentrations at Albany are shown to exceed those at Waterford, a grab sample at the Mohawk River at Cohoes will be collected to investigate whether the Mohawk is the source of elevated PCB levels in the Lower Hudson River. If sampling indicates that PCB levels in the Mohawk River have increased significantly, the Mohawk River station will be sampled at the same frequency as the Albany and Poughkeepsie stations during Phase 1.

These monitoring contingencies are for remediation of River Section 1 more than one mile upstream from the Thompson Island monitoring location.

If there were an accidental release in a section that was not undergoing remediation at that time, the two stations at least one mile downstream of the accidental release would be representative until the situation was resolved. Representative stations must always be more than one mile downstream from the source of the resuspended material. In the event that a far-field suspended solids resuspension criterion is exceeded, the far-field station would be monitored for PCBs (*Hudson EPS* Volume 2 p. 113).

To comply with the WQ Health (Water Source) standard, daily composite samples will be collected for metals analysis at Schuylerville, Stillwater, and Waterford, with sample aliquots collected at a frequency of twice per hour. In the event of an exceedance, the sampling frequency will be increased to four composites per day with sufficient volume collected to analyze for dissolved and total metals. If manual monitoring is implemented due to automated station failure or maintenance, discrete sampling will be conducted with consideration of time of travel. The results of TSS samples collected in conjunction with Resuspension Standard monitoring may substitute for those required for WQ requirements, provided that the number of samples and timing of sample collection corresponds to those collected for metals analyses. Continuous turbidity monitoring for the WQ requirements will be performed in conjunction with monitoring for the Resuspension Standard.

2.3 Sampling Methods

The design of the sampling program is based on the need to meet the following objectives:

Objectives for Far-Field Monitoring in the Upper Hudson

- Provide a set of data to demonstrate compliance with the Resuspension Standard Total and Tri+ PCB concentration thresholds.
- Provide a set of data to demonstrate compliance with the WQ requirements.
- Provide a means to rapidly assess water column Total PCB levels so that the EPA can advise public water suppliers when water column concentrations are expected to approach or exceed the federal MCL (i.e., 500 ng/L) during the remediation.
- Provide a set of data to demonstrate compliance with the Total PCB load components of the Resuspension Standard (i.e., 300 g/day and 600 g/day).
- Determine the primary means of PCB release via dredging-related activities.
- Determine the baseline Total PCB levels entering River Section 1 from upstream sources.

- Determine ancillary remediation-related effects on the river (e.g., barge traffic-related resuspension, spillage during transit or off-loading of sediment) that may occur in areas that are not captured by the nearest representative far-field station.

Objectives for Near-Field Monitoring in the Upper Hudson

- Provide a real-time indication of suspended solids release in the near field.
- Provide a set of data to demonstrate compliance with the WQ requirements.
- Determine the amount of suspended solids released by the remedial operations to provide an indication of PCB export.
- Verify that the NYSDEC surface water quality regulations are not violated during the remediation.

Additional Monitoring Objectives

- Monitoring in the Lower Hudson to examine the effect of Upper Hudson dredging activities on Lower Hudson PCB concentrations.
- Verify the selection of the monitoring locations.
- Non-Target Area Monitoring: Determine the degree and extent of contamination resulting from the remedial operations downstream from the target areas. (See Section 8).

Adjustments to the sampling program will be made through corrective action memoranda (CAMs) subject to EPA approval.

No splitting of water samples is permissible for any measurements that must accurately reflect the suspended solids content. If duplicate samples are required, the sample bottles for the duplicate and sample analysis can be deployed at once or in series to generate co-located samples. Sample bottles for PCB and suspended solids analysis should be deployed simultaneously if possible (*Hudson EPS* Volume 2 p. 110).

During the BMP, GE is testing automated sampling systems for both near-field and far-field monitoring. Based on the results of these tests, the Phase 1 RAM QAPP will provide necessary details on the sampling program. In the event that the automated samplers are not able to provide data of adequate quality to address the Resuspension Performance Standards, the Phase 1 RAM QAPP will provide an alternate monitoring method to evaluate compliance with the Resuspension Performance Standards monitoring requirements. In this case, the Phase 1 RAM QAPP will provide for the collection of data required at the routine level and will use best efforts to propose a program to address the objectives of the Resuspension Performance Standards at higher action levels. In addition, the Phase 1 RAM QAPP will specify contingencies in the event of automated sampler failure during dredging.

2.3.1 Near-Field Monitoring

Near-field monitoring requires the collection of continuous water column monitoring data for temperature, specific conductance, pH, DO, and turbidity and the collection of TSS grab samples and metals and hardness composite samples. Continuous water column monitoring data will be acquired using a YSI 6000 Series multi-parameter probe (or equivalent). This probe will be suspended from the monitoring platform at a conservative depth in the water column (i.e., toward the bottom of the water column) at ~ 75% of the water column depth or a minimum of 2 feet off the bottom. Confirmatory TSS samples will be collected at the same depth at which the water quality monitoring probes are deployed, such that these samples may be directly compared to the concurrent continuous turbidity measurements. If the surrogate relationship is not adequate for one or more stations, vertically integrated grab samples for compliance monitoring will be collected. Hardness and metals samples will be collected using an automated sampling system (ISCO or equivalent) with the sampling manifold located at the same depth in the water column as the probe.

As described in Section 2.2.1, the automated sampling system will be configured to draw aliquots at the highest frequency that can be practically achieved. In the event that an automated sampler fails, grab samples for metals and hardness will be collected at 75% of the water depth or a minimum of 2 feet off the bottom at the prescribed daily frequency.

2.3.1.1 Demonstration of Near-Field Automated Samplers during Phase 1

As noted Section 2.3 above, efforts will be made during the BMP to demonstrate the utility of automatic samplers for near-field monitoring. Sampling will be conducted during Phase 1 to verify that the automatic samplers meet the requirements of the EPS and to support modifications or maintenance of the systems that may be needed to meet those requirements. The near-field monitoring will be for continuous water quality parameters and metals. The DQOs and sampling requirements are described below:

Assess the vertical location of the intakes.

Turbidity data will be collected through the water column at each near-field station during remedial operations once a week throughout Phase 1. The data will be assessed to determine if the single intake captures the average (or higher) concentration in the water column. The location of the single intake in the water column may be adjusted based on review of the data.

Determine the long-term calibration and stability of continuous water quality monitoring probes.

The same water parcel will be measured for the continuous water quality parameters (turbidity, DO, pH, conductivity and temperature) using the automated sampler and a calibrated instrument with the probe at the level of the single intake. All stations will be assessed on a weekly basis throughout Phase 1. The data will be assessed using a control chart method (specific thresholds to be defined in the Phase 1 RAM QAPP).

2.3.2 Far-Field Monitoring

At the automated far-field stations, water will be pumped continuously through the system from several sampling inlets located along a cross-river transect. The water from each sampling location will be combined and continuous water quality monitoring measurements will be made on this combined stream using in-line probes located near the automated system's sampling port. In this way, the continuous water quality measurements will be representative of conditions at the time the sample aliquots are collected. As described in Section 2.2.2, sample aliquots will be collected from the combined stream using an automated sampler (ISCO or equivalent) at the highest frequency that can be practically achieved with a minimum of every 30 minutes, to form station composite samples. This departure from the monitoring requirements of the standard is acceptable to EPA as long as the automated samplers are shown to meet the data quality objectives specified in the EPS.

If the surrogate relationship is not adequate for one or more stations, suspended solids samples will be collected every 3 hours, 24 hours per day with a maximum 24-hour turnaround time but reasonable efforts will be utilized to reduce the 24-hour turnaround time. The turnaround time starts at sample receipt by the laboratory. Corrective measures will be taken to update or change the surrogate relationship to bring it back within the performance metrics set in the Phase 1 RAM QAPP which are based on the EPS requirements, the special study to Develop and Maintain of a Semi-Quantitative Relationship between TSS and a Surrogate Real-Time

Measurement For the Near-Field and Far-Field Stations (Full Scale), the TSS surrogate study (QEA, 2005a) and subsequent phases of the TSS surrogate study. These measures may include the collection of laser particle size measurements (if applicable) and additional TSS samples, bench-scale TSS studies, and the evaluation of the performance of automated sampling equipment (if used) and turbidity probes.

At the Bakers Falls, Albany, Poughkeepsie, and Mohawk River stations, sampling will be performed at a centroid location using the manual BMP sampling protocol.

2.3.2.1 Demonstration of Far-Field Automated Samplers During Phase 1

As noted Section 2.3 above, efforts will be made during the BMP to demonstrate the utility of automated samplers for far-field monitoring. Sampling will be conducted during Phase 1 to verify that the automated samplers at the far-field stations meet the requirements of the EPS. The results of this sampling may indicate that modifications or maintenance of the systems is required. The DQOs and sampling requirements are described below:

Determine whether the automated samplers collect a sample that is comparable to the vertically integrated grab samples under construction conditions. These samples are necessary to determine if the automated sampler collects a representative sample, even though the samplers do not collect a vertically integrated sample. This sampling is not required if the samplers are located in an area that EPA agrees is likely to be well mixed.

If the TI Dam station is located above the dam, the Phase 1 RAM QAPP will address the issue of vertical integration and comparability with the original TI Dam station. If needed, paired samples may be collected during Phase 1.

Determine the integrity of the samples collected with automated samplers. Determine if the sampling devices are aging or corrupted by biofilms. This test must be completed on each station because construction may differ from one station to another and the degree of biofilm development may differ depending on local conditions such as the location of CSOs.

Samples will be collected from each intake line at the pump house while timing the sample to match discrete samples collected at the intake ports to the automated sampler. Both the pump house samples and the intake point samples will be composited, generating a single sample for the intakes and a single sample from the pump house. All far-field stations will be sampled. The frequency of sampling will be proposed for EPA approval based on review of the automated sampler data collected during baseline. Each sample will be analyzed for TSS, PCB, and metals (where measured for WQ requirements) throughout Phase 1. The results of the sampling will be assessed using a control chart method based on the absolute difference between the measurements and the relative percent difference. If the data appear to have a bias, the sampling apparatus will be modified (such as by increasing the flow) and samples will be collected with the modified sampler.

In addition, pressure testing of the lines will be conducted at a frequency that will be proposed for EPA approval based on review of the automated sampler data collected during baseline.

Assess the performance of the autosamplers.

The performance of the automated samplers will be assessed based on the concentration relationships among far-field monitoring stations on a weekly basis throughout Phase 1. All measured parameters will be considered (Total PCBs, Tri+ PCBs, and all probe measurements). The assessment of the data will be qualitative with comparison of Phase 1 measurements to the baseline monitoring program results.

If the relationships among the far-field stations are not comparable to baseline conditions, it may be necessary to modify the location or number of substations in the cross-section of one or more stations. USGS guidance should be consulted to determine the number of EDI stations required in the cross-section (USGS, 2002. National Field Manual for the Collection of Water-Quality Data, Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Section 4.1.1, http://water.usgs.gov/owq/ FieldManual/.). PCB fluxes are expected to remain relatively constant downstream of the dredging operation, with only minor increases, and PCB and TSS concentrations are expected to gradually decline in response to increases in flow (e.g., from tributaries) downstream of the dredging operations.

Determine the long-term calibration and stability of continuous water quality monitoring probes.

During sampling to assess the integrity of the automated samplers over time, water quality data will be collected continuously in the river at each pump intake and in the corresponding pump discharge in the pump house for a minimum of one half hour during the manual sampling to be conducted in conjunction with the automated sampling. The samples will be measured for turbidity, particle distribution, DO, pH, conductivity, and temperature. The results of the sampling will be assessed using a control chart method based on the absolute difference between the measurements and the relative percent difference.

2.3.3 Equipment Maintenance and Calibration

Testing of the near- and far-field sampling equipment, including automatic samplers and continuous water quality monitoring instruments, will be performed during the pilot study. The need for and scope of ongoing evaluations of the ability of the automatic samplers and continuous water quality monitoring equipment to collect representative data will be identified prior to Phase 1. Appropriate operation, maintenance, and calibration procedures will be developed and incorporated into the Phase 1 RAM QAPP.

Near-Field continuous monitors will be checked daily for problems such as bio-fouling and damage (*Hudson EPS* Volume 2 p.106).

2.4 Analytical Methods

Samples will be analyzed according to the requirements of the *Hudson EPS* Volume 2, Section 4.2.6 except for modifications presented herein and unless EPA agrees to other modifications. Adjustments to the sampling program will be made through CAMs subject to EPA approval.

The analytical methods will need to be sensitive enough to measure water column concentrations of PCBs at each station. For Total and Tri+ PCBs, a PCB analytical method with a detection limit low enough to detect expected PCB concentrations at Bakers Falls, Rogers Island, and Waterford is required (*Hudson EPS* Volume 2 p. 103). The current PCB analytical methods specified in the BMP QAPP are expected to meet detection limit requirements during remedial action.

The analytical methods chosen for this program must meet or exceed the specifications of the methods used in the baseline monitoring program in terms of precision, sensitivity, accuracy, representativeness, comparability, completeness and sensitivity. The only exception to this requirement would be in the case that efforts to produce a modified method for TSS to allow a reduced turnaround time are successful. The same analytical methods chosen for each station will be maintained at each station throughout the program for consistency (*Hudson EPS* Volume 2 p. 103).

2.4.1 Suspended Solids

Suspended solids analysis will be conducted using EPA Method 160.2 with modifications to be consistent with American Society for Testing and Materials (ASTM) Method D 3977-97, with a 24-hour turnaround time. However, during non-routine monitoring, reasonable efforts will be made to reduce the 24-hour turnaround time. Any modifications to the method made to reduce turnaround time will be detailed in the Phase 1 RAM QAPP.

2.4.2 PCBs

Analysis of whole water PCBs will be conducted using the modified Green Bay Method (mGBM) and extraction protocols used during the BMP. Under routine monitoring, samples collected at the two nearest far-field stations to the dredging operations (Thompson Island and Schuylerville for Phase 1) will have a 24-hour turnaround time from the time that the last sample is collected at either of these stations until the results are reported from the laboratory, to the extent that such turnaround time is feasible. The time between sample collections at these stations will not exceed four hours. Samples will be processed in batches to provide some daily measure of QA/QC (e.g., laboratory control spikes and continuing calibration standards). However, given the field and laboratory logistics required to provide results within 24 hours, it will not be possible for the initial analytical results to have undergone the standard QA/QC procedures. All PCB samples will be subject to electronic verification and a subset (minimum 5%) will be subject to manual validation. The validation will be frontloaded in order to assess the analyses early in the season. The QA/QC details for PCB analytical samples will be provided in the Phase 1 RAM QAPP.

At stations downstream from the two nearest far-field stations to the dredging operations, Bakers Falls and Rogers Island, PCB results will be reported within 72 hours of collection during routine monitoring. If the Control or Standard Level is exceeded, analyses for samples collected from the stations at Thompson Island, Schuylerville, Stillwater, and Waterford will all have 24-hour turnaround times, to the extent feasible. In this case, reporting of results from the station in exceedance (to confirm the results per the EPS) and Stillwater and Waterford (to be protective of water supplies) will be prioritized. The details of the QA/QC procedure will be provided in the Phase 1 RAM QAPP.

2.4.3 Organic Carbon

Samples will be analyzed for DOC and POC using EPA Method 415.1, as described in the BMP QAPP. Sample turnaround times will be the same as for PCBs at each station.

2.4.4 Metals and Hardness

Metals analysis for the WQ requirements will be conducted using EPA Method 200.8, with the exception of mercury, which will be analyzed using EPA Method 1631, and hexavalent chromium, which will be analyzed using colorimetric Method SW-846 7196A (although Method SW-846 7199 may be used as an alternate procedure for samples when interference exists with the colorimetric Method SW-846 7196A). Each metals composite will be considered a sample upon the collection of the last aliquot. As discussed in Section 2.1.2, samples from near- and far-field stations will be analyzed for total and dissolved cadmium and lead under routine conditions. In the event of an exceedance of an applicable metals standard in either the near field or the far field, the subsequent samples collected for metals analysis from such location(s) will be analyzed for the suite of total and dissolved metals subject to the applicable set of standards, until such time as the metals concentrations fall below the standards. If, during in-water activities, distressed or dying fish are observed, increased monitoring will be conducted for metals (total and dissolved) and additional water quality parameters, where appropriate, in accordance with the Phase 1 ID PSCP Scope (Section 7.5) and WQ Substantive Requirements (p.9). At that time, routine metals monitoring will resume. Hardness analysis will be conducted on near-field samples using EPA Method 130.2.

Initially, the laboratory will be required to report the metals results from the far-field stations within 24 hours of the last sample collected at the far-field stations, to the extent feasible. Given the field and laboratory logistics required to provide results within 24 hours, it will not be possible for the initial analytical results to have undergone standard QA/QC procedures. The amount and type of QA/QC procedures will be delineated in the Phase 1 RAM QAPP.

2.5 Off-Season Water Column Monitoring

In the off-season when dredging activities have ceased, the sampling schedule currently being followed under the BMP will continue, with certain modifications. Specifically, this sampling will include routine weekly sampling for PCBs, TSS, DOC, and POC at the five Upper Hudson River stations (to the extent that weather and river conditions allow), monthly sampling at Bakers Falls and at the Lower Hudson River stations at Albany and Poughkeepsie and every other month at the Mohawk River. Metals sampling will not be conducted during the off-season.

2.6 Public Water Supply Monitoring

When dredging operations are underway, the frequency of monitoring for PCBs will be increased at the public water supply facilities for the Town of Halfmoon and the City of Waterford. This monitoring will augment the already extensive water column sampling to be conducted in the river, which will ensure that PCB levels at the far-field stations remain below the Standard Level set forth in the Resuspension Standard. That Standard Level is a confirmed total PCB concentration of 500 ng/L, which is the same as the National Primary Drinking Water MCL.

The monitoring of the potable water supplies will be on raw and finished water and the analytical method will be EPA Method 508 (PCBs as Aroclors) in accordance with 40 CFR 141.24. This monitoring will be done weekly when dredging operations are underway. The party performing the remedy will work with the water suppliers and the regulatory agencies to implement the plan described above.

2.7 Fish Monitoring

Throughout the RA period, fish collections will continue to be performed in the Upper Hudson River and Lower Hudson River as described below, except that (a) the sampling locations may be modified, if necessary and with EPA approval, to avoid impacts from dredging in that year, and (b) the total number of fish samples collected in each river section each year may be modified upon EPA approval in consultation with the NYSDEC.

2.7.1 Sampling Locations

In the Upper Hudson River, fish sampling will be conducted at locations identified to coincide with the BMP fish sampling locations. Specifically, fish sampling will be conducted in the Upper Hudson River from each of the river sections at the stations listed below:

- Feeder Dam (representative of reference conditions);
- Thompson Island Pool (representative of River Section 1);
- Northumberland/Fort Miller Pools (representative of River Section 2); and
- Stillwater Pool (representative of River Section 3).

In the Lower Hudson River, fish monitoring will be conducted at the following stations:

- Albany/Troy (location will coincide with the BMP fish sampling locations);
- Catskill; and
- Tappan Zee area.

2.7.2 Sampling Frequency

Sampling will be conducted annually at the Upper Hudson River stations. At the Lower Hudson River stations, fish sampling will be conducted annually at Albany/Troy and every two years at Catskill and Tappan Zee.

2.7.3 Species and Sampling Methods

This section specifies the species to be sampled during the remedial action.

2.7.3.1 Upper Hudson River

In the Upper Hudson River, the same species groups as are sampled in the BMP will be collected. These species groups are:

- Black bass (largemouth and/or smallmouth bass, with a goal of half of each species but in whatever combination is available to meet the applicable sample size from Section 2.7.4);
- Ictalurids [bullhead (brown and/or yellow) and/or channel catfish (white and/or channel), with a goal of half of each species but in whatever combination is available to meet the applicable sample size from Section 2.7.4);
- Yellow perch;

- Yearling pumpkinseed; and
- Forage fish (spottail shiner and/or alternative).

Standard sampling methods, including netting, electroshocking, and angling, will be used to collect target species. The samples to be processed for analysis will be standard fillets for bass, bullhead, catfish, and perch; individual whole body samples for yearling pumpkinseed; and whole body composites for spottail shiners or other forage fish species.

2.7.3.2 Lower Hudson River

At the Lower Hudson River stations, the following species will be sampled as part of the fish monitoring program:

- At Albany/Troy: striped bass, black bass (largemouth and/or smallmouth bass, 10 of each, or in whatever combination is available for a total of 20), ictalurids [10 bullhead (brown and/or yellow) and/or 10 catfish (white and/or channel), or in whatever combination is available for a total of 20], and perch (white and/or yellow, 10 of each, or in whatever combination is available), yearling pumpkinseed and forage fish (spottail shiner and/or alternative) - all to be collected annually;
- At Catskill, striped bass, black bass (largemouth and/or smallmouth bass, 10 of each, or in whatever combination is available), and ictalurids [10 bullhead (brown and/or yellow) and/or 10 catfish (white and/or channel), or in whatever combination is available] - all to be collected every 2 years; and
- At Tappan Zee area, striped bass - to be collected every 2 years.
- These samples will be processed as standard fillets.

2.7.4 Sample Size

Sample size within each pool in the Upper Hudson River will be the same as described in the BMP QAPP (QEA 2004). For locations where individual fish will be submitted for analysis, the number of fish to be collected will consist of a maximum (i.e., more of one species may be collected than another in order to achieve the total if one species is present in smaller numbers, or not at all) of: 20 individuals per species group at Feeder Dam; 25 individuals per species group at Northumberland/Fort Miller pool; and 30 individuals per species group at each of the Thompson Island and Stillwater pools. The individuals may be collected from multiple stations within the pool, as necessary to achieve a representative River Section-wide average. In addition, where forage fish will be sampled, 10 whole body composites of forage fish will be collected from each pool (two composites per location).

At each of the Lower Hudson River stations, a maximum of 20 individuals of each species group will be collected.

2.7.5 Measurements

PCBs and percent lipid will be measured to monitor PCB levels in fish. All fish samples will be analyzed for total PCBs using a modification of the EPA Method 8082 Aroclor Sum Method, as specified in the BMP QAPP (QEA 2004), unless EPA determines that the data quality objectives established in the Phase 1 RAM QAPP can no longer be assessed by that method. Analysis by the mGBM will be performed on 5 percent of the total number of samples, during every other sampling event that is conducted at a given sampling location, in order to verify that the Aroclor method is accurately quantifying the Total PCB concentrations in fish, as the contaminant pattern in fish may change as a result of the remediation, which may affect the quantification by the Aroclor method. The weight and length of collected fish also will be measured to assess fish condition. Captured fish will be visually inspected for external abnormalities (e.g., tumors, lesions). Sex of fish will be determined, if possible, prior to processing in the analytical laboratory.

2.8 Reporting

An electronic data export will be provided to the EPA on a weekly basis. The export will contain the most recent version of the data at the time of file creation. Additionally, a "readme" file documenting data additions and corrections will be provided with the database. Changes and/or updates to the project data will be documented by two methods. Data verification and validation changes will be detailed in the automated data verification module (DVM) and validation reports. Other significant changes to the database will be documented in corrective action memoranda provided electronically to the EPA.

The analytical results and continuous water column monitoring data will be reported as follows:

- Continuous water column monitoring data will be made available immediately to the EPA's designated representative in the field and will be submitted to the EPA within 12 hours of collection.
- The reporting system will be designed such that additional sampling can commence within 6 hours of any reported near- or far-field exceedance.
- Analytical results will be made available to the EPA upon receipt from the laboratories. The data package contents will be defined in the Phase 1 RAM QAPP.
- Any exceedances of the 500 ng/L total PCB standard will be reported to the EPA within 3 hours of laboratory reporting.
- Any near-field exceedances of the Acute Aquatic standards will be reported promptly to EPA and NYSDEC, but no later than 3 hours after receipt of the laboratory data.
- Any exceedances of the Health (Water Source) standards or of the NYSDOH action or trigger levels for lead, as defined in Section 2.1.2, will be reported to EPA, NYSDEC, NYSDOH, and the downstream public water suppliers promptly, but no later than 3 hours after receipt of the laboratory data.
- Weekly reports will be submitted that summarize the results of near- and far-field monitoring, exceedances of criteria, and any corrective actions taken.

Such reporting will be facilitated through the use of a data management system that will post results for authorized project personnel in near-real time, allow for the creation of summary reports, and provide notification of exceedances. The project manager or designated representative will submit a weekly report with the requisite information. Further details regarding the reporting will be included in the Phase 1 RAM QAPP.

The data from the off-season water column and fish monitoring programs will be provided to EPA in the monthly reports and monthly database updates under the Consent Decree.

In addition, Data Summary Reports (DSRs) that document the data collected will be provided by April 1 in the year following Phase 1 dredging for both the water column and fish monitoring programs. The Phase 1 DSR will fully document the work, including a summary of the work performed, a tabulation of results, field notes, processing data, chain-of-custody (COC) forms, copies of laboratory audits, data validation results, copies of laboratory reports, and a compact disk version of the project database.

3. Sediment Residuals Monitoring

A residuals sampling and evaluation program will be implemented to monitor the level of PCBs in sediment remaining in dredge areas.

3.1 Objectives and Criteria

The objectives of the Sediment Residuals Monitoring Program are to:

- Verify the removal of the sediment PCB inventory in dredge areas; and
- Determine the concentrations of Tri+ PCBs in sediment residuals (i.e., individual node concentrations, arithmetic average, and median) ; and
- Provide information for evaluation of the Residuals Performance Standard.

This section presents the locations and frequency for sample collection activities pursuant to the Residuals Performance Standard, including:

- Collection of samples to assess Tri+ PCB levels in residuals immediately following dredging;
- Collection of samples to assess Tri+ PCB levels in residuals immediately following re-dredging;
- Collection of samples to assess Tri+ PCB inventory in sediment remaining after dredging; and
- Collection of samples to assess Tri+ PCB levels in backfill.

For clarity, the above activities are referred to herein as “post-dredging residuals sampling,” “post-re-dredging residuals sampling,” “post-dredging inventory sampling,” and “backfill sampling.” Residuals sampling will target the top 6 inches of the post-dredging surface.

Residuals sampling will be performed in each certification unit (CU), as described further below, following completion of dredging activities. The sampling results will be evaluated against criteria presented in the Residuals Performance Standard to determine whether the standard has been met or contingency actions are required. Sampling locations, collection methods, and analytical methods for the Sediment Residuals Monitoring Program are described below in Sections 3.2 through 3.4. Contingency actions may require additional sampling and analysis, such as re-dredging sampling activities, etc., depending on the results of the initial sampling effort. These activities are described in Section 3.5 – Contingency Monitoring.

3.2 Monitoring Locations and Frequency

Samples will be collected for residuals characterization following completion of all dredging activities in a given CU. Requirements of *Hudson EPS* Volume 3, Section 4.1 for sampling grid establishment will be complied with. In general, a CU will consist of approximately 5 acres and will be sampled at 40 locations on a triangular grid, except in the following circumstances:

- Isolated dredge areas smaller than 5 acres will be designated as a single CU, and samples will be collected from 40 locations along a proportional grid.
- Non-contiguous dredge areas smaller than 5 acres and within 0.5 mile of one another may be evaluated as a single CU, up to a maximum area of 7.5 acres. For resulting CUs less than 5 acres in size, samples will be collected from 40 locations along a proportional grid while CUs greater than 5 acres will be sampled using a grid with 80-foot spacing (i.e., up to 60 samples for a 7.5-acre area).
- If a number of noncontiguous dredging areas smaller than 5 acres in size are contained within a common silt barrier during dredging, the construction manager must submit a proposal to EPA that explains how the dredging project will be managed to prevent the spread of contamination to the interstitial, non-targeted areas, or propose additional sampling to investigate those areas during residuals sampling in the CUs.
- Contiguous dredging areas up to 7.5 acres in size may be considered a single CU and sampled using a grid with 80-foot spacing (i.e., up to 60 samples for a 7.5-acre area).
- Contiguous dredging areas between 7.5 and 10 acres will be divided into two CUs of equivalent area, and 40 samples collected from each CU along a proportionate grid.
- Contiguous dredging areas larger than 10 acres will be divided equally into approximately 5-acre CUs, and samples collected in each CU using a grid with 80-foot spacing.

Specifics of the CUs and their associated sampling grid will be established following development of the dredge prisms during design and will conform to the above requirements. Sampling points for compliance with the Residuals Performance Standard criteria and Phase 1 ID PSCP Scope Section 3 will be located only in areas where inventory dredging was conducted. If overdredge areas (i.e., side slope areas located laterally outside the areas identified in the *Dredge Area Delineation Reports*) are not backfilled, these locations will also be sampled at the same frequency, and the results will be used to evaluate the residual levels remaining in these areas because the spatial extent of these areas is not known at this time. The size of the CU will be estimated based on the area where inventory dredging was conducted. As noted above, approximately 40 to 60 samples will be collected from each CU along a triangular grid. The grid will be offset from the design support sampling grid used in the Sediment Sampling and Analysis Program (SSAP) such that the residuals sampling nodes are located between 40 and 60% of the distance between SSAP sampling nodes, with the goal being 50% of the nodal distance. If obstructions are encountered at a grid node, the sample will be relocated within a 20-foot radius of the original location.

Sampling in a CU will be completed within 7 days of completion of each dredging attempt in that CU. Samples may be collected prior to completion of the unit as long as the area sampled complies with the requirements of the Phase 1 ID PSCP Scope Section 3.1. Cores will initially be advanced to a depth of 2 feet and samples collected from the 0- to 6-inch interval using the methods discussed in Section 3.3. It may be necessary to re-sample some nodes for deeper samples, if the depth of contamination (DoC) has not been identified and the DoC cannot be estimated through extrapolation. The remainder of the core will be archived according to the same procedures used during the SSAP; archived samples will be stored until EPA permits the samples to be disposed. However upon notification to EPA, GE may dispose of samples one year after collection unless EPA chooses to have GE transfer the samples to EPA or its representative. The core depth may be modified during implementation of the residuals sampling program, with EPA approval, based on the results for CUs sampled early in the program. Such modifications will be made through GE's submission of a CAM for EPA approval.

3.3 Sampling Methods

Sample collection and processing will generally follow the SSAP protocols, with modifications to incorporate requirements from the Residuals Performance Standard. The protocols to be followed for sample collection are presented below, followed by the protocols for processing.

3.3.1 Sample Collection

- Samples will be collected via coring, vibracoring, or manual coring techniques.
- Clear Lexan tubes (or other appropriate semi-transparent tubes) will be used for manual coring. If substrate conditions are such that manual coring is not feasible, cores will be retrieved using vibracoring.
- If vibracoring is employed, the rig will be activated at the sediment-water interface and used throughout the full depth of the core.

- Under conditions where a core cannot be collected, samples will be collected using small ponar-type samplers.
- Core locations will be located using GPS and referenced to an appropriate horizontal coordinate system and vertical datum.
- Sampling locations and all other field data will be recorded.
- Sediment probing will be conducted in an adjacent location prior to core collection to identify the approximate depth and the texture of the sediments.
- Backfill samples and samples from re-dredged nodes will also be collected as 0-to-6-in core samples; and in all respects sample collection, management, and analysis will be identical to residual sediment samples.
- The probing information will be used to determine if a core can be obtained, or if a grab sampler should be deployed instead.
- Design information and probing results will be used to determine the target coring depth.
- Sediment cores will be advanced to a depth of 2 feet (with the objective of collecting a representative surficial 0- to 6-inch sample), or to refusal (if less than 2-foot depth).
- Core recovery will be measured upon collection directly through visual inspection of the sample and confirmed after extraction of the core during processing.
- Actual sample recovery will be calculated by dividing the length of the sediment recovered by the total penetration depth of the core.
- The sampler will document sediment recovery, visually classifying the sediment sample and the thickness of the residuals layer.
- When probing indicates less than 6 inches of sediment over a hard material, at least one attempt will be made to collect a core. A ponar grab sample will be collected when the sediment core cannot be collected.
- If sample recovery is hindered by the presence of bedrock, up to three attempts will be made to retrieve sediments using a coring approach (manual or vibracore) within a 20-foot radius from the proposed sampling location. If that approach is unsuccessful, grab sample collection will be attempted using a ponar-type sampler for up to three additional attempts. Following such attempts, if sediment recovery is still not attainable, presence of bedrock will be noted at the location and the rig will move to the next sampling location.
- If a ponar dredge is used, it will be of sufficient size to penetrate at least 6 inches or the thickness of sediment believed present on the river bottom, whichever is less.
- After collection, the core will be capped, sealed, and labeled. Labeling will include core identification information, date, time, and an arrow to indicate the upper end.

- All other information will be recorded in a field log book.
- The cores will be transported with river water in the headspace to minimize disturbance of the top core layer.
- The cores will be stored on ice on a storage rack in a vertical position and kept in the dark until submitted for processing and analysis.
- Ponar samples will be homogenized in a dedicated, laboratory-decontaminated, stainless steel bowl, transferred to an appropriately selected and labeled sample jar, and stored on ice in a cooler until submitted for processing and analysis.

3.3.2 Sample Processing

- A field processing facility similar to that used in SSAP activities will be used.
- Retrieved core samples will be photographed.
- Field notes will arrive at the processing facility with the core or ponar sample and be entered into the database.
- The initial core processing step will be to drain the excess water, once the fine particles have settled with the goal of minimizing disturbance to the fluff layer.
- The weight of the core tube will then be measured and will be used as an initial estimate of the sediment bulk density.
- Any observed sediment "fluff" layer (the layer the measuring stick will go through to hit the sediment-water interface) will be retained and homogenized with the 0- to 6-inch sample.
- For cores, obvious disturbances to sediment layer created due to the dredge will be documented. Observations including thickness of separate layers of redeposited sediments, disturbed sediment, and undisturbed underlying sediment will be recorded.
- The length of the recovered core will be measured, the core tube will be marked to identify where it will be cut into segments (if more than the 0- to 6-inch segment will be analyzed), and an arrow will be marked on each segment to indicate the upper end.
- The core will be cut into 6-inch segments prior to extrusion. Since the core sections will be separated prior to the extrusion process, the sediment will only be extruded from the section of core tubing that corresponds to the sample to be mixed and analyzed, in most cases, the 0-to-6 in interval. While the core tube is being cut, support will be given to the areas above and below the cut. Once the core tube has been cut through, the core segment will be separated from the rest of the core.

- Sediment will be extruded using a decontaminated stainless steel tool and rigorously homogenized using decontaminated stainless steel or glass equipment.
- Visual descriptions will be recorded into the database, including a description of the physical characteristics of the core segment; general soil type (sand, silt, clay, and organic/other matter such as wood chips, as determined using the Unified Soil type Classification System (USCS); approximate grain size; and presence of observable biota, odor, and color. If Glacial Lake Albany Clay is observed, the presence of clay will be confirmed by a manual test of plasticity. The nature and length of stratigraphy changes will also be noted, if present. Visual texture characterization will be done by a field geologist or equivalent.
- Objects of cultural significance, if present, will be noted in the database, inspected by a qualified geomorphologist or archaeologist, and stored at the processing facility.
- Wood chips will not be separated, but manually pulverized or chopped as necessary to allow homogenization with and inclusion in the sediment samples submitted for laboratory analysis.
- Sample aliquots designated for analysis will be chilled to 4°C and kept in a dark location until sent to the analytical laboratory.

3.4 Analytical Methods and Quality Assurance/Quality Control Procedures

Sediment samples will be analyzed for PCBs using Method GEHR8082, the same method used during the SSAP. To the extent feasible, these analyses will achieve a reporting limit of 0.1 ppm for each PCB Aroclor, with a Method Detection Limit (MDL) of 0.05 ppm or a reporting limit equivalent to 0.1 ppm for Tri+ PCBs over the range of conditions that can be anticipated (e.g., high moisture content). Prior to submittal of the Phase 1 RAM QAPP, GE will submit for EPA review and approval, additional paired analysis using GEHR8082 and the mGBM to refine the regression equation to meet the reporting limit of 0.1 ppm. The information will identify the source and number of samples to be used to develop the conversion and the approach for developing the regression equation. The samples will also be analyzed for moisture content (as part of the PCB analyses) using EPA Method 160.2. If a regression equation is approved by EPA, 4 percent of the samples will be analyzed by the PCB method used to develop the equation, throughout remediation. The paired estimates of Tri+ PCB will be used to assess and maintain the regression throughout the remediation.

If during remediation, a regression equation is used to estimate Tri+ PCBs, a sample with detection(s) of one or more Aroclors that are not included in regression equation, and the concentration of these Aroclors is more than 5 percent of the Total PCB concentration, then a means of calculating Tri+ PCBs will be proposed for this sample for EPA's review and approval, for instance, add any Aroclors not in the regression equation to the 1242 plus 1254 total.

QA/QC procedures for residuals sampling will be described in the Phase 1 RAM QAPP and be approved by EPA. The parties agree that it is critical to generate high quality data with sufficient QA/QC to adequately document CU closure decisions on a timely basis. The parties further agree that results from manual data validation will be a critical component to the overall QA/QC program (particularly in the beginning of the project) and will be used to continuously evaluate and improve analytical procedures, but manual data validation will not be used as a basis to revisit decisions already made regarding actions on a specific CU.

3.5 Contingency Monitoring

Following the initial post-dredging residuals sampling and analysis, the resulting PCB data will be reviewed to determine the appropriate response. Under the Residuals Performance Standard, there are four possible responses:

- Response 1: Backfill and demobilize at a CU (including testing of backfill if necessary).
- Response 2: Jointly evaluate a 20-Acre Average.
- Response 3: Re-dredge or Construct Subaqueous Cap at a CU.
- Response 4: Re-dredging is required.
- Response 5: Capping.

The criteria to be used to determine which of these responses will be implemented during Phase 1 dredging, and the methods used to apply these criteria, will follow the Residuals Performance Standard, as described in the Phase 1 ID PSCP Scope, and will be presented in more detail in the Phase 1 IDR and Phase 1 FDR and the Phase 1 PSCP; these criteria and methods are not discussed herein.

This section describes the additional sampling and analysis associated with one or more of these responses – namely, re-dredging residuals sampling/analysis, inventory re-characterization sampling/analysis, and backfill sampling/analysis. These activities, where performed, will be conducted in accordance with the sampling and analytical methods described in Sections 3.3 and 3.4 and the Phase 1 ID PSCP Scope Section 3.4.

In areas where re-dredging is conducted, residuals samples will be collected following completion of each re-dredge attempt from the re-dredged nodes and analyzed. Re-dredging sample core locations will be offset from the original residuals sample grid by 10 feet. Samples will be collected from the 0- to 6-inch depth interval.

Samples from depths below 6 inches may be analyzed for PCBs to define the depth of contamination as specified in the Phase 1 ID PSCP Scope.

Backfill samples will be collected, when required, along the same grid as the residuals samples. Backfill samples will be collected from the 0- to 6-inch depth interval. Backfill samples will be analyzed for PCBs using the same procedure described for residual samples in Section 3.4 above.

In addition, construction monitoring will be implemented during cap placement activities. This construction monitoring will be described in the *Construction Quality Assurance Plan* for Phase 1 dredging operations, which is discussed in Section 4 of the Phase 1 IDR.

3.6 Data Reporting

Weekly progress reports will be prepared and submitted to the EPA site manager according to an agreed upon schedule with the GE and EPA. The reports will summarize, at a minimum, the following:

- Results of residuals sampling;
- Exceedances of the Residuals Performance Standard by CU and joint 20-acre evaluation area; and
- The course of actions that were undertaken, and rationale.

Also, laboratory data will be made available to the EPA upon receipt from the laboratory.

A CU Completion Report will be prepared and submitted to the EPA, according to an agreed upon schedule. Each CU Completion Report will include:

- CU identification;
- Description of the type(s) of dredging equipment used;
- Description of sediment type(s) encountered;

- Results of residuals sampling;
- Sediment imaging results (if available);
- Written verification that the sampling data were verified in accordance with the procedure described in Section 3.4 above, including a discussion of any data qualifiers applied;
- Results of the required comparisons to action levels for each dredging pass;
- Discussion of any contingency actions taken;
- Number of dredging passes for residuals concentration reduction;
- For each attempt, a map of the CU showing the concentration at each node and the non-compliant area (if any) to be re-dredged or capped;
- A signed verification that the CU was backfilled or capped (as applicable) in accordance with the requirements of the Phase 1 ID PSCP Scope, the Phase 1 PSCP, and the approved remedial design, as well as any other applicable requirements under the Consent Decree; and
- A signed verification that the initial habitat replacement/reconstruction was completed (as applicable) in accordance with the requirements of the approved remedial design, as well as any other applicable requirements under the Consent Decree.

4. Air Quality and Odor Monitoring

An air quality and odor monitoring program will be conducted to assess achievement of the standards set forth in the QoLPS for air quality and, as necessary, for odor. Specific objectives and criteria for air monitoring are described below, organized according to:

- PCBs;
- Criteria Pollutants;
- Opacity; and
- Odor (including hydrogen sulfide [H_2S]).

4.1.1 PCBs

The objective of PCB air quality monitoring is to assess the potential exposure of receptors in the project area to airborne emissions of PCB from the project.

The EPA determined that emissions of PCBs during remediation activities could result in a short-term increase in ambient air levels of these pollutants. The QoLPS for air quality has been established to confirm that this potential impact does not result in unacceptable exposure.

The Air Quality Standards for PCBs, as set forth in the *Hudson QoLPS* (pp. 6-8 & 6-18), are as follows:

- During remedial action, the Residential Standard is:

  24-hour average, total PCBs = 0.11 micrograms per cubic meter (μg/m^3), with a “Concern Level” of 0.08 μg/m^3 (24-hour average) total PCBs.

- During remedial action, the Commercial/Industrial Standard is:

  24-hour average, total PCBs = 0.26 μg/m^3, with a “Concern Level” of 0.21 μg/m^3 (24-hour average) total PCBs.

4.1.2 Criteria Pollutants

In accordance with the *Hudson QoLPS* (pp. 6-9 to 6-1), an assessment will also be made of the following pollutants for which the EPA has promulgated National Ambient Air Quality Standards (NAAQS) (known as "criteria pollutants"): nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter with a median diameter of 10 micrometers or less (PM_{10}), particulate matter with a median diameter of 2.5 micrometers or less ($PM_{2.5}$), and ozone (O_3). Ozone (O_3) is evaluated using its precursors, NO_x and volatile organic compounds (VOCs).

The need for monitoring of these constituents will be determined during remedial design using specific design data. The RD Team will repeat the assessment in EPA's *White Paper – Air Quality Evaluation* analyses (EPA, 2002) using project specific design data. If this project specific information developed during design validates the assumption used in EPA's *White Paper – Air Quality Evaluation* analyses (EPA, 2002), this will be considered a determination of compliance with the QoLPS such that further demonstration by on-site or offsite sampling will not be required. If air quality compliance is not demonstrated as a result of these analyses for any NAAQS, potential design changes that could result in achievement of the NAAQS and/or the need for monitoring for such pollutant(s) will be evaluated, and will submit a proposal on this topic to EPA for review and approval.

4.1.3 Opacity

The Air Quality Standard for opacity, which is based on New York State air regulations (6 NYCRR Title III, Subpart 211.3), is that opacity must be less than 20% (as a 6-minute average), except that there can be one continuous 6-minute period per hour of not more than 57% opacity (*Hudson QoLPS*, p. 6-16).

4.1.4 Odor

The stated objective of the QoLPS for odor is to protect the public from odors that unreasonably interfere with the comfortable enjoyment of life and property (*Hudson QoLPS*, p. 6-18). Odors are difficult to measure because they depend on not only the concentration of the pollutant, but also on the sensitivity of the person exposed to the odor. The QoLPS for odor has two components. The first is a standard for H_2S of 14 µg/m^3 (0.01 ppm), expressed as a 1-hour average, which applies if an odor identified as H_2S is detected by workers or the public. The second component is that odor complaints will be investigated and mitigated, as appropriate (*Hudson QoLPS*, p. 6-19).

4.2 Monitoring Locations and Frequency

The locations and frequency of the air quality and odor monitoring program are described below. Detailed monitoring plans will be submitted as part of the Phase 1 RAM QAPP.

4.2.1 PCBs

Air monitoring will be conducted, employing samplers operating continuously for 24 hours, to verify the assessment and demonstration of compliance with the QoLPS for PCBs. Such monitoring will be conducted at locations along the dredging corridor, at unloading areas, and around the sediment processing/transfer facility (processing facility), as discussed further below. (Note that the monitoring for unloading areas and processing facility may be combined, depending on final configuration of the processing facility.) In addition, monitoring will be conducted at a permanent background station situated upwind of the Phase 1 dredge areas, the unloading areas, and the processing facility. This station will be situated permanently at a fixed upwind location away from the river and operate throughout the entire term of the remediation program. The specific location for this station will be specified in the design documents. If an approach other than a standard EPA-approved method is being proposed to demonstrate compliance, that approach will require EPA approval and will be specified in the Phase 1 RAM QAPP.

Further, a meteorological station will be established at the processing facility to provide meteorological data for use in this air monitoring program. The specific location for this meteorological station, as well as the equipment to be used at the station, will be specified in the design, which will consider EPA guidance for siting meteorological monitoring stations (EPA, 2000b).

Monitoring Site Selection Process

In selecting locations for the PCB monitoring stations, a three-tiered site selection process will be applied. This process will involve application of the following criteria.

The primary criteria for site selection will involve consideration of the location of the facility perimeter (for monitoring stations that are to be placed on that perimeter), pertinent information on predominant wind direction and wind vectors, and pertinent information on the most likely receptor locations. Information on predominant wind direction and vectors will be obtained through review of the historical meteorological data collected at Albany Airport, in combination with data collected from the meteorological station at the processing facility prior to project start-up. This information will be coupled with dispersion modeling analyses of air emissions to identify the most likely receptor locations.

The secondary criteria for site selection will involve application of the EPA's and U.S. Army Corps of Engineers' (USACE's) guidelines applicable to ambient particulate sampling systems (EPA, 1987; USACE, 1997). These criteria include the following:

- Height of sampler inlet above ground (2 to 15 meters);
- Distance of sampler from trees (> 20 meters);
- Distance from sampler to obstacle at least twice the height of the obstacle above the sampler;
- Unrestricted airflow (270^{o} arc of unrestricted space around sampler);
- Roof placement > 2 meters from any wall, parapet, penthouse, etc., and no nearby flues that may significantly impact sampling;
- Sufficient separation of the sample inlet from nearby roadways to avoid the effects of dust re-entrainment and vehicular emissions on measured air concentrations; and
- Avoidance of locating particulate matter sampling systems in an unpaved area unless there is vegetative ground cover so that the effect of locally re-entrained fugitive dusts will be kept to a minimum.

The tertiary criteria will consist of logistical considerations, including availability of electrical service, site accessibility, site operator safety considerations, and the availability of site security to mitigate tampering with and/or vandalism of instrumentation.

The details on monitoring locations will be provided in the Phase 1 IDRs and/or Phase 1 IDRs and the Phase 1 RAM QAPP.

Monitoring Frequency

The Phase 1 monitoring for PCBs will be conducted at the following frequencies:

- Stations at the sediment processing facility and unloading areas will be sampled continuously during processing plant operations, and a 24-hour sample will be collected at each station for each day during such operations. Additionally, at least 2 days of baseline data, prior to the start of processing operations, will be collected at the processing facility stations.
- Representative stations within the dredging corridor will be sampled continuously during dredging, and a 24-hour sample will be collected for each day during dredging operations. Additionally, at least 2 days of baseline data, prior to the start of dredging, will be collected at stations that are representative of the first day of dredging.
- The permanent background station will be sampled continuously during dredging or processing plant operations, and a 24-hour sample will be collected for each day during such operations. The sample at this station will be analyzed for PCBs. Additionally, at least 2 days of baseline data will be collected at this station prior to the start of dredging.

During Phase 1 operations, EPA will determine if the objectives of the air monitoring program can be achieved with less frequent monitoring or monitoring at fewer stations (e.g., only selecting the samples collected at the predominantly downwind and upwind stations for analysis).

Meteorological Monitoring

Meteorological data will also be collected at the processing facility. These data will consist of wind speed, wind direction, and ambient temperature collected on a continuous basis during project operations and/or during ambient air monitoring. Data will be collected as 5-minute averages and downloaded for archival storage. The meteorological station will be placed atop a tower and situated so as to meet EPA siting criteria for meteorological monitoring stations (EPA, 2000b).

4.2.2 Criteria Pollutants

As discussed above in Section 4.1.2, sampling for criteria pollutants is not expected to be required. Should the design suggest that this monitoring is required, the details will be specified in the Phase 1 EMP to be submitted with the Phase 1 FDR, as well as reflected in the Phase 1 RAM QAPP.

4.2.3 Opacity

The opacity standard will be applied to vessels, vehicles, and equipment as a performance standard for this project. The locomotives used by rail carriers will not be subject to this opacity standard. These line-haul engines are regulated by EPA's national standards governing opacity (40 CFR Part 92). However, the switcher engine used to operate the on-site rail yard will be subject to the QoLPS for opacity. Vessels and vehicles used for this project will be maintained and operated properly to prevent opacity problems. Also, pollution control systems for process equipment will be designed to prevent opacity concerns. The primary monitoring for opacity will be visual observations. As described in Section 4.3.3, these observations will be made by a certified visual observer using EPA Method 9 documented in field logs. Opacity will be observed at the initial start-up of each piece of equipment permanently assigned to the site that has air emissions. Additional opacity observations will be made if an opacity complaint is received from the public.

4.2.4 Odor

Receptors include residents along the river and users of the river such as boaters. Odor measurement is difficult because no instrument has been found to successfully measure odor and all of its components. The human nose is the most effective instrument to measure odor, but personal preference affects what is considered acceptable or offensive. Instruments can measure some compounds that make up odor (e.g., H_2S), but odor is typically a combination of many compounds. A high or low concentration of just one compound is not generally a good indicator of whether an offensive odor is present.

Although odor measurements are difficult, monitoring can be implemented to demonstrate compliance with the ambient air concentration standards. An assessment of potential activities and conditions that could result in exceeding the H_2S standard or in the detection of other odors will be performed during remedial design. However, if an odor complaint is received or if workers detect an unacceptable odor, and the odor is identified as potentially H_2S, H_2S monitoring will commence. At this time, specific locations and frequency for such monitoring cannot be defined, but it is anticipated that two locations would be monitored – one upwind and one downwind of the suspected source of odors.

4.3 Sampling Methods

4.3.1 PCBs

High-volume air samplers (e.g., Tisch or Andersen PS-1) fitted with a polyurethane foam (PUF) cartridge and a glass-fiber filter will be used for sampling for PCBs in ambient air, where practical. This sampling approach is consistent with EPA Method TO-4A (January 1999). The detection limit for PCBs, expressed as an Aroclor-based total PCB concentration, is expected to be 30 nanograms per cubic meter (ng/m^3) employing this methodology. Lower-volume pumps, which operate with a rechargeable battery, may be used in locations where electricity is not available, provided that a 24-hour sample can be collected. This sampling approach is consistent with EPA Method TO-10A (January 1999). Procedures and modifications, if any, for these methods will be described in the Phase 1 RAM QAPP.

4.3.2 Criteria Pollutants

No sampling for criteria pollutants is anticipated to be required. However, if such sampling is required, the sampling methods will be specified in the Phase 1 EMP and Phase 1 RAM QAPP.

4.3.3 Opacity

A certified observer will visually observe opacity using EPA Method 9 at the point of emission and record this reading using Method 9 datasheets in a field log. A detailed procedure with be provided in the Phase 1 RAM QAPP.

4.3.4 Odor

When sampling for H_2S is warranted, H_2S levels will be measured via direct readings using a hand-held meter (e.g., Arizona Instruments Jerome Meter) or, when this is not possible, via collection in an evacuated Tedlar bag followed by measurement using a hand-held meter. In the latter case, the H_2S meter can be brought to the sample or the sample can be transported in the Tedlar bag to the meter for direct measurement of H_2S. The Tedlar bag will allow multiple samples to be collected simultaneously and will allow more rapid deployment of the sampler. These samples will be collected over a one-hour period using a low-volume sampling pump that draws ambient air into the evacuated bag. These devices will be available at the processing facility, at barge unloading areas, and at shoreline locations, such that pumps and bags can be readily deployed to the site of the odor in the event of a complaint. A detailed procedure with be provided in the Phase 1 RAM QAPP.

4.4 Analytical Methods

4.4.1 PCBs

Air samples will be analyzed for PCBs, using a gas chromatograph fitted with a capillary column in combination with an electron capture detector (GC/ECD). Results will be reported as Aroclor-based PCBs concentrations, consistent with Method TO-4A. However, this analytical method will be optimized for monitoring Hudson-specific PCB air samples collected at the site, so that the results present accurate total PCB quantitation. The procedure to optimize the GC/ECD analysis will be described in the Phase 1 RAM QAPP.

Under routine monitoring conditions, the laboratory will be required to report the PCB results within 72 hours of receipt of the air sample by the laboratory. A shorter turnaround time of 48 hours will be employed during start-up or when changes in operations take place, such as relocation of dredging operations; this shorter turnaround time will be used for the 5 consecutive days of monitoring in such circumstances. Additionally, a turnaround time of 48 hours will be employed in situations where PCB concentrations in any sample exceed the daily average total PCB standards or are greater than the Concern Levels (which represent 80% of the Standard Levels). Such contingency sampling is discussed further below.

4.4.2 Criteria Pollutants

No sampling for criteria pollutants is anticipated to be required. However, if such sampling is required, the analytical methods will be specified in the Phase 1 EMP and Phase 1 RAM QAPP.

4.4.3 Opacity

A certified EPA Method 9 opacity reader will make and record observations for opacity; as such, no analytical methods will be needed.

4.4.4 Odor

H_2S levels will be determined by hand-held direct reading H_2S monitors (e.g., Arizona Instruments Jerome meter). When the Tedlar bag sampling method is used, ambient air samples will be collected over a 1-hour period at the location of an odor complaint, employing an evacuated Tedlar bag fitted with a sampling pump. Measurement of H_2S concentrations in each bag will then be made with a portable meter. In those instances where the odor complaint occurs near the location of the hand-held meter, the Tedlar bag sample may not be necessary as H_2S concentrations can be measured directly with the meter. A detailed procedure will be provided in the Phase 1 RAM QAPP.

4.5 Contingency Monitoring

In the event of an exceedance of the PCB Concern Level or PCB Standard Level or receipt of an odor complaint, contingency monitoring will be performed as outlined below. Details regarding the contingency monitoring will be provided in the Phase 1 RAM QAPP and Phase 1 RA CHASP.

4.5.1 PCBs

If a Concern Level is exceeded (i.e., daily average PCB concentration greater than 80% of the Standard Level), then the following contingency monitoring will occur:

- Examine background PCB concentrations (sampling-event-specific as well as baseline database) and site-specific meteorological data to assist in PCB emissions source identification; and
- Reduce analytical turnaround time to 48 hours from the receipt of the sample at the laboratory.

If the daily average total PCB concentration exceeds the Standard Level, then the following contingency monitoring will occur:

- Establish additional monitoring stations as needed to evaluate cause of increased emissions, utilizing the three-tiered site selection process described above;
- Examine background PCB concentrations (sampling-event-specific as well as baseline data base) and site-specific meteorological data to assist in PCB emissions source identification;
- Reduce laboratory turnaround time to 48 hours; and

- Continue monitoring to confirm compliance with the standard.

4.5.2 Odor

In the event of an odor complaint, the complaint will be recorded and investigated in accordance with the Phase 1 RA CHASP and its Scope. If an odor complaint is received from workers or the public and the odor is identified as potentially H_2S, sampling will be implemented to confirm and measure H_2S concentrations. If the H_2S standard is exceeded or there are recurrent odor complaints, H_2S monitoring will be conducted on a regular basis until compliance with the standard is established. This monitoring will include the use of Tedlar bags for the collection of 1-hour air samples, with subsequent analyses employing a hand-held meter (e.g., Arizona Instruments Jerome). Mitigation measures and associated monitoring will be evaluated and implemented as appropriate, and this action will be recorded in a log.

4.6 Data Reporting

4.6.1 PCBs

Regular weekly progress reports will be submitted to the EPA that include information related to PCB concentrations in air near the processing facility and dredging operations, ambient (background and baseline) PCB levels, and monitoring plan adjustments. These weekly reports will be provided to the EPA in conjunction with the project implementation schedule. Report content and distribution will be described in the Phase 1 RAM QAPP.

The EPA will be notified of an exceedance of the 24-hour PCB standard promptly, but no later than 3 hours following receipt of the analytical data. In the event of an exceedance, a report will be developed that includes an analysis of the reasons for the exceedance and a description of any mitigation measures. The written report will be provided to the EPA within 3 working days of the discovery of the exceedance. This report will include background and baseline monitoring data to help determine whether the project is the source of the exceedance or whether there are external reasons for the exceedance. A summary of data collected at the on-site meteorological station (e.g., wind rose) will also be provided in support of report findings and conclusions regarding the potential source(s) of the PCBs. Contingency report content and distribution will be described in the Phase 1 RAM QAPP.

4.6.2 Odor

During dredging operations, a monthly report will be submitted to the EPA summarizing the monitoring activities for the previous month. The summary will be in tabular format and will include a log of any odor complaints, monitoring, and the necessary information and follow-up actions needed to resolve the complaint. An example of the log will be included in the Phase 1 RAM QAPP and Phase 1 RA CHASP.

The EPA will be notified of odor complaints from the public or of an exceedance of the H_2S performance standard within 24 hours of discovery. A report outlining the reasons for the exceedance and any mitigation measures taken will be submitted to the EPA within 10 days of the event. Report content and distribution will be described in the Phase 1 RAM QAPP and Phase 1 RA CHASP.

5. Noise Monitoring

The purpose of the Noise Monitoring Program is to allow the RA team to make operational changes to mitigate any potential noise impacts.

5.1 Objectives and Criteria

The objectives and criteria of noise monitoring are described in this section, which is organized as follows:

- Noise standards;
- Monitoring locations and frequency;
- Sampling and analytical methods;
- Contingency monitoring; and
- Reporting.

5.2 Noise Standards

The QoLPS criteria for noise that have been developed for the remedial action, as set forth in the *Hudson QoLPS* (p. 6-25), are as follows:

- Short-Term – These criteria apply to facility construction, dredging, and backfilling activities:

    - Residential Control Level (maximum hourly average)
      Daytime = 75 dBA (A-weighted decibels)

    - Residential Standard (maximum hourly average)
      Daytime = 80 dBA
      Nighttime (10:00 pm – 7:00 am) = 65 dBA

    - Commercial/Industrial Standard (maximum hourly average)
      Daytime and nighttime = 80 dBA

- Long-Term – These criteria apply to processing facility and transfer operations:

  - Residential Standard (24-hour average)
    Day-night average = 65 dBA (after addition of 10 dBA to noise levels measured from 10:00 pm to 7:00 am)

  - Commercial/Industrial Standard (maximum hourly average)
    Daytime and nighttime = 72 dBA

The attenuation model will be utilized to predict and evaluate noise levels and the results are presented in the Phase 1 IDR. If there is a predicted exceedance at a receptor location, based on a scaling factor relative to the monitoring point as predicted by an attenuation model, noise controls will be integrated into the design.

During project operations, the attenuation model will be used to evaluate noise levels at the receptor based upon noise levels on the perimeter of the facility or dredging area. A predicted exceedance will trigger additional monitoring at the point of exceedance or, if possible, the nearest possible receptor. If the additional monitoring shows attainment of the standard, the predicted exceedance will be reported with a note that monitoring at the receptor demonstrated attainment. If additional monitoring shows continued exceedances of the standards, the project team will implement a contingency monitoring program, which is discussed later in Section 5.4 - Contingency Monitoring.

5.3 Monitoring Locations and Frequency

Potential noise impacts due to Phase 1 project activities can be divided into short- and long-term impacts for both residential and commercial/industrial environments in the daytime and nighttime. The compliance point for noise monitoring will be at the nearest receptor, either industrial or residential. If it is determined that noise levels are below the standards closer to the source of the noise, then the closer locations will be considered acceptable for demonstrating attainment of the standards. During the design, more accurate information will become available to better specify noise monitoring locations.

Monitoring will be conducted in the slow response mode for continuous equivalent sound level over a 1-hour period (L_{eq}(h)) at the receptor location while the process or activity is at peak load. The L_{eq} monitoring duration can be shortened for sources having steady noise emission levels.

Monitoring will be conducted on a regular basis (at a minimum of every 4 hours) during construction of the processing facility. Potential reduction of the monitoring frequency will be evaluated on an ongoing basis, with reductions implemented if approved by EPA. Once construction has been completed, monitoring will be conducted during the startup of the facility (to validate design assumptions) and on a regular basis during typical facility operations. If noise levels measured at monitoring locations during the remedial action indicate, based upon predictive analyses, that noise levels at a given receptor would exceed the Control Level or limits established by the standard, that receptor location will be monitored, if practical, to demonstrate attainment. Monitoring frequency will be increased if the daytime Control Level or nighttime standard is exceeded. In addition, more frequent monitoring (i.e., hourly monitoring) will be conducted as needed to evaluate changes in operations or to respond to complaints. Background levels will be measured in cases where noise levels approach the standard or to distinguish between project-related and non-project related noise. Where and when possible, routine monitoring locations will be at the fenceline of the processing and unloading facilities and the shoreline of the river, adjacent to dredging operations.

At the beginning of Phase 1, a noise study will be conducted to collect noise level data from the dredging operation at various distances. The noise study will be a 2-week study, which will measure noise emissions from the dredging, barge transport, unloading, and processing operations. This study will measure 1-hour L_{eq} noise for all major operations. There will be approximately 20 full 1-hour sampling events for dredging, barge transport, unloading, and processing facility operations, cumulatively. Data gathered from this study will be used to validate design and to confirm that the operations are attaining the noise standard as set forth in the QoLPS. In addition, based on this information and using calculations for noise attenuation over distance, noise monitoring requirements may be modified, with EPA concurrence, during the dredging of some locations where the nearest receptors are distant or noise levels are consistent. During Phase 1 dredging, monitoring will be conducted on a regular basis (a minimum of every 4 hours) while the dredging and backfilling operations are ongoing if receptors have been determined to be within the impact range of the project (i.e., within the range where the model indicates that there could be an exceedance of the standard.) Potential reduction of the monitoring frequency will be evaluated on an ongoing basis.

Table A5-1 outlines the Noise Monitoring Program for Phase 1 dredging operations.

Table A5-1 – Noise Monitoring Program Summary

Operations	Monitoring Plan	Additional Comments
Background Noise Levels	A 2-week noise monitoring study will be conducted to establish baseline noise levels at the processing facility, as well as at locations that will be representative of receptor locations during Phase 1 dredging operations. A minimum of three 24-hour sampling events will be conducted for the processing facility. A minimum of five 24-hour sampling events will occur along the dredging corridor. This effort will be used to establish 1-hour L_{eq} noise levels at different times of the day for various receptor locations.	Additional background noise data may be needed if background noise levels at receptors are close to or exceed the noise standards.
Phase 1 Noise Study	At the initial startup of Phase 1 dredging operations, a 2-week study will measure noise levels around the dredging, unloading, and processing operations. This study will measure 1-hour L_{eq} noise for all major operations. There will be approximately 20 full 1-hour sampling events making up this noise study. This study will include monitoring data from dredging, barge transport, unloading, and processing facility operations.	
Construction Monitoring	During construction of the processing facilities, noise monitoring will occur at a minimum of every 4 hours. This monitoring will measure 1-hour L_{eq} noise levels.	Should noise monitoring over a 2-week period demonstrate no exceedances of the noise standards, the potential for reducing the frequency of noise monitoring for construction will be reviewed and may propose a modification to the noise monitoring frequency to EPA. Should construction activities exceed the noise standards, additional monitoring will be performed in accordance with Section 5.4 – Contingency Monitoring.
Dredging Operations - Compliance Monitoring	Noise monitoring will be conducted at a minimum of every 4 hours (day and/or nighttime). It is anticipated that many of the noise monitoring locations, for dredging operations, will be located on nearby shorelines.	Should noise monitoring demonstrate no exceedances of the noise standards, the potential for reducing the monitoring frequency will be reviewed and may propose a modification to EPA.

Operations	Monitoring Plan	Additional Comments
Dredging Operations - Contingency Monitoring	Should monitoring results of dredging operations indicate a noise level that exceeds the control level or if a project-related noise complaint is received, monitoring will be conducted for at least 1 hour to demonstrate compliance with noise standards. If the trigger for additional monitoring is a complaint, noise monitoring will be conducted at the location in question from the complaint.	Contingency monitoring is discussed further in Section 5.4 – Contingency Monitoring. Should monitored noise levels demonstrate exceedances of the standards, additional background noise monitoring may be needed to assess the potential impact of non-project-related noise source sensitive receptors.
Processing Operations - Compliance Monitoring	Noise monitoring will be conducted at a minimum of every 4 hours. At a minimum, one monitoring location will be identified for the processing facility and one for unloading operations. The specific locations will be shown in the Phase 1 IDR. The Phase 1 IDR will also show modeled results from processing and unloading operations that will help focus on specific areas adjacent to the processing facility that may be of concern. For each monitoring location, the Phase 1 IDR and *Final Design Reports* will identify the nearest receptors. The distance from the monitoring location to the nearest receptors will be used to model noise levels throughout the day and evening, as measured at the monitoring locations, which would keep project operations within Compliance and Concern Levels.	
Processing Operations - Contingency Monitoring	Should monitoring results of processing/unloading operations indicate a noise level that exceeds the control level, monitoring will be conducted to demonstrate compliance with noise standards. If the trigger for additional monitoring is a complaint, then noise monitoring will be conducted at the location in question from the complaint.	Should monitored noise levels demonstrate exceedances of the standards, additional background noise monitoring may be needed to assess the potential impact of non-project-related noise source.

5.4 Monitoring Methods

A Type 1 or Type 2 sound-level meter, as rated by the American National Standards Institute (ANSI), will be used to measure noise levels.

5.5 Contingency Monitoring

Contingency noise monitoring is described conceptually in this Section. The Concern and Exceedance Levels for the QoLPS for noise are described in the *Hudson QoLPS* (p. 6-38). The triggers for taking action to address noise exceedances and complaints at the Control and Exceedance Levels, as well as potential mitigation efforts, are outlined in the Phase 1 ID PSCP Scope and Phase 1 ID RA CHASP Scope and will be discussed further in the Phase 1 PSCP and Phase 1 RA CHASP, as well as in the Phase 1 design reports.

If a noise complaint is received from the public and is verified as project-related, monitoring will be conducted at the site of the complaint as necessary to determine if the Control Level or standard has been exceeded.

In the event that noise levels above the Control Level or a standard are recorded (whether in response to a complaint or otherwise), additional monitoring will be conducted (as needed) to evaluate the cause of noise increases, and noise monitoring will continue until it confirms that noise levels are below the applicable noise standard. In addition, should monitored noise levels demonstrate exceedances of the noise standard as set forth in the QoLPS, additional background noise monitoring may be needed to assess the potential impact of non-project-related noise source on receptors.

Information related to contingency actions that would be employed to mitigate noise exceedances will be provided as part of the Remedial Design documents as well as in the Phase 1 PSCP and Phase 1 RA CHASP.

5.6 Data Reporting

Records of noise measurements will be maintained, including the measurement location, time of measurement, meteorological conditions, identification of significant sound sources, model and serial numbers of all equipment used, and calibration results. These results will be documented on daily noise monitoring field data sheets or by using automated data loggers during times when noise monitoring is being conducted. Noise complaints will be documented as described in the Phase 1 RA CHASP. A monthly report will be sent to the EPA summarizing the monitoring activities for the previous month. The summary will include (in tabular format) the date, time, location, activity being conducted, and results in dBA. The summary will also include (in tabular format) a log of any noise complaints and the necessary information and follow-up action needed to resolve the complaint. Only noise complaints (as opposed to inquiries), as defined in the Phase 1 RA CHASP and its Scope, will be reported on a routine basis.

The EPA will be notified of any exceedances of the noise standard within 24 hours after the discovery. In the event of any occurrence of the Concern Level (as defined in the QoLPS for noise), a follow-up report will be sent to the EPA describing the response. When there is an occurrence of the Exceedance Level, a report outlining the reasons for the exceedance and any mitigation employed will be submitted to the EPA within 10 days of the event.

6. Lighting Monitoring

To meet the project schedule, nighttime activities may be necessary, which would require artificial lighting. Specifically, artificial lighting may be needed for dredging operations, sediment offloading, processing, and rail loadout activities at night; this lighting may affect nearby receptors. This section describes the Lighting Monitoring Program that will be conducted during Phase 1 to implement the QoLPS for lighting. However, the lighting QoLPS will not supersede worker health and safety lighting requirements established by the Occupational Safety and Health Administration (OSHA).

6.1 Objectives and Criteria

The main objectives of the Lighting Monitoring Program are to monitor and assess lighting impacts. The lighting standards established by the EPA in the *Hudson QoLPS* (p. 6-39) are as follows:

- Rural and suburban residential areas = 0.2 footcandle.
- Urban residential areas = 0.5 footcandle.
- Commercial/industrial areas = 1 footcandle.

Similar to other nuisance impacts, all lighting complaints will be addressed as described in the Phase 1 PSCP and Phase 1 RA CHASP and their Scopes.

6.2 Monitoring Locations and Frequency

Potential lighting impacts due to project activities may occur in various types of areas, which can be divided into rural and suburban residential areas, urban residential areas, and commercial/industrial areas. The primary compliance point for the light standards will be at the receptor. However, if it is determined that light levels closer to the source meet the lighting standards, such locations will be considered acceptable for demonstrating attainment.

Light monitoring will be conducted at the property line of the receptors nearest to the dredging operations that have the potential to experience an exceedance of the lighting standards or at locations closer to the lighting source (e.g., the shoreline). Such monitoring will be conducted three times between 10:00 pm and dawn during the first night of dredging activities at a given area to assess achievement of the standard. Monitoring will be repeated whenever the dredging operation is moved to a different dredge area. Monitoring will also be performed during Phase 1 at the perimeter of the processing facility or at the nearest receptor property line when the facility initially begins activities after dusk and when significant changes in lighting for the facility have been made. Complaints will also trigger additional monitoring, as described below.

6.3 Monitoring Method

A footcandle meter will be used to measure illumination.

6.4 Contingency Monitoring

Contingency light monitoring is described conceptually in this Section. The Concern and Exceedance Levels for the QoLPS for lighting are described in the *Hudson QoLPS* (p. 6-45). The triggers for taking action to address lighting exceedances and complaints at the Control and Exceedance Levels, as well as potential mitigation efforts, are outlined in the Phase 1 ID PSCP Scope and Phase 1 ID RA CHASP Scope and will be discussed further in the Phase 1 PSCP and Phase 1 RA CHASP, as well as in the Phase 1 Design Reports.

If a lighting complaint is received from the public and is verified as project-related, monitoring will be conducted at the site of the complaint as necessary to determine if the lighting standard as set forth in the QoLPS has been exceeded.

In the event that light levels above the applicable standard are recorded (whether in response to a complaint or otherwise), regular light monitoring will be conducted (as needed) to evaluate lighting conditions, and will be continued until achievement of the standard is confirmed.

6.5 Data Reporting

Monitoring results will be documented on light monitoring field data sheets. Records of measurements will be made, including specifics of the measurement location, time of measurement, meteorological conditions during the measurement, identification of significant light sources (including non-project-related sources such as streetlights or moonlight), and model and serial numbers of all equipment used to measure illumination. Lighting complaints will be addressed as described in the Phase 1 RA CHASP and its Scope.

A monthly report summarizing the monitoring activities for the previous month will be submitted to the EPA. The summary will be in a tabular format and will include the monitoring results, as well as a log of any lighting complaints received (including date and time received) and a description of the action taken to resolve the complaint.

The EPA will be notified of any exceedances of the lighting standard within 24 hours after the discovery. In the event of any occurrence of the Concern Level (as defined in the QoLPS for lighting), a follow-up report will be sent to the EPA describing the response. When there is an occurrence of the Exceedance Level, a report outlining the reasons for the exceedance and any mitigation employed will be submitted to the EPA within 10 days of the event.

7. Monitoring of Discharges to Hudson River and Champlain Canal (Land Cut above Lock 7

The WQ requirements consist of: 1) requirements relating to in-river releases of constituents not subject to the EPS, as set forth in *Substantive Requirements Applicable to Releases of Constituents not Subject to Performance Standards*; 2) the substantive requirements for discharges to the Hudson River and Champlain Canal, as set forth in *Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharges to Champlain Canal (land cut above Lock 7)* and 3) *Substantive Requirements of State Pollutant Discharge Elimination System Permit for Potential Discharge to the Hudson River*. These three sets of requirements are contained in a single document in the form of a letter to GE with enclosures that EPA issued on January 7, 2005.

This section addresses the monitoring requirements for discharges to Hudson River and Champlain Canal (land cut above Lock 7), including the associated monitoring requirements, sample and analytical methods, contingency monitoring, and reporting requirements. Requirements relating to in-river releases are detailed in Section 2.

7.1 Discharge Limitations

Effluent limitations for discharges of water from the sediment processing facility are described in Section 8 of the Phase 1 ID PSCP Scope.

7.2 Monitoring Locations and Frequency, Sampling and Analytical Methods

The following monitoring requirements for the above discharges will be implemented. Additional details will be specified in the Phase 1 EMP and the Phase 1 RAM QAPP.

- Discharge flow will be measured continuously with a flow meter.
- pH will be monitored in the discharge monthly in a grab sample.
- All other parameters will be measured weekly, with PCBs to be measured as a 24-hour runtime composite and the other parameters to be measured in grab samples.

- PCBs will be analyzed by EPA Method 608. The laboratory will be instructed to make all reasonable attempts to achieve a MDL of 0.065 µg/L for each Aroclor.
- Mercury will be analyzed by EPA Method 1631.

7.3 Contingency Monitoring/Response Actions

In the event of an exceedance of the discharge limitations, the response actions described in Section 8.3 of the Phase 1 ID PSCP Scope will be performed. If such actions require additional monitoring, the scope of such monitoring will be set forth in the Engineering Evaluation Report described in that Section of the Phase 1 ID PSCP Scope. If additional testing is proposed, the EPA will be notified of the anticipated additional testing.

7.4 Data Reporting

A monthly report will be submitted to the EPA that includes the routine monitoring results for discharges to the Hudson River and the Champlain Canal (Land Cut above Lock 7). Both concentration (mg/L or µg/L) and mass loadings (lbs/day) will be reported for all parameters except flow and pH. In the event of an exceedance of the discharge limitations or PCB detection, a separate report will be prepared and submitted to the EPA , as described in Section 8.3 of the Phase 1 ID PSCP Scope. Copies of monitoring data and reports submitted to the EPA will be provided to the NYSDEC.

Monitoring data, engineering submissions, and modification requests will be submitted to the EPA with a copy sent to the NYSDEC.

8. Special Studies

This section describes the special studies that will be carried out to provide information to evaluate and refine the implementation of the Resuspension Standard. As stated in the *Hudson EPS* (Vol. 2, p. 118): "The special studies will be conducted for limited periods of time to gather information for specific conditions that may be encountered during the remediation or to develop an alternate strategy for monitoring. Specific conditions may include different dredge types, contaminant concentration ranges, and varying sediment textures. Each of these studies is integral to the Phase 1 evaluation, the development of Phase 2, and is also tied to compliance issues."

The Resuspension Standard (*Hudson EPS*, Vol. 2, pp. 118 *et seq.*) specifies the following special studies:

- Near-field PCB Release Mechanism (Near-field PCB Concentrations);
- Development of a Semi-Quantitative Relationship between TSS and a Surrogate Real-Time Measurement for the Near-field and Far-field Stations (Bench Scale);
- Development of a Semi-Quantitative Relationship between TSS and a Surrogate Real-Time Measurement for the Near-field and Far-field Stations (Full Scale);
- Non-Target, Downstream Area Contamination; and
- Automated Monitoring (referred to the in *Hudson EPS* as "Phase 2 Monitoring Plan").

As discussed in Section 2 of this Phase 1 ID RA Monitoring Scope, the special study directed to developing a TSS surrogate relationship and the special study on automated monitoring are described in separate work plans (QEA 2005a and 2005b). This section presents the work plans for the special studies of Near-field PCB Release Mechanism and Non-Target Downstream Area Contamination.

8.1 Near-Field PCB Release Mechanism

8.1.1 Objective

The objective of this study is to determine the nature of PCB release during dredging (sediment resuspension/particle-associated or dissolved phase mechanism). If near-field TSS concentrations can be considered a reliable indicator of PCB releases due to dredging-related activities then real-time TSS surrogate measurements that will be taken at near-field stations may be used to identify when modifications of dredging activities to reduce resuspension are needed and to anticipate when elevated PCB concentrations may be expected at far-field monitoring stations.

8.1.2 Study Areas

The study will be carried out at multiple locations so that a range of dredging conditions can be evaluated (e.g., different sediment types (cohesive and non-cohesive), PCB concentration ranges, and the range of dredge types expected to be selected in the Final Design Reports). Five locations have been chosen, four in the Northern Thompson Island Pool (NTIP) and one to the east of Griffin Island (EGIA) (Figures A8-1 and A8-2). The characteristics of these locations are summarized in Table A8-1:

Table A8-1 - Summary Statistics for Special Study Areas

Location (Figures A8-1 and A8-2)	Side-Scan Sonar Designation	Mean % Silt & Clay	Mean % Fine Sand	Mean % Med./Coarse Sand & Gravel	Mean % Organic	Mean T - PCB Conc. (ppm)	Mean DOC (in.)	Mean Tri+ PCB MPA (g/m2)
1	Transitional	24	31	44	1	17	15	8
2	Transitional	18	8	73	1	32	27	18
3	Sand	9	21	68	2	34	25	17
4	Fine	19	45	34	2	50	33	18
5	Fine	73	17	11	0	444	21	24

Notes:
1. Mean DOC and mean tri+ PCB MPA are area-weighted.
2. Mean percent sediment type and the mean total PCB concentration are volume-weighted, and are calculated using measured or extrapolated data down to the average depth of dredging.
3. Average depth of dredging is based on the 6/8/05 version of the married grid which covers both dredge and non-dredge areas.

8.1.3 Monitoring Frequency and Duration

Discrete monitoring of each study area will be performed on three occasions, spaced approximately 2 days apart.

8.1.4 Monitoring Stations

A single background station will be located about 100 m upstream of the dredging activity near the approximate centerline of flow through the area of dredging activity. This station will be coincident with the upstream near-field station used to assess compliance with the Resuspension Standard so that the other parameters measured at this station may be factored into the interpretation of the study results. To monitor the loss of TSS due to settling and the desorption of PCBs that occurs as resuspended sediments are transported downstream, transects will be placed at nominal distances (e.g., 30 m, 100 m, and 300 m) downstream of the dredging activity in the approximate center of the plume. Sampling in close proximity to the near-field stations will provide measurements of PCB phase distribution that directly address the issue of the correlation between near-field TSS surrogate measurements and PCB release. The three downstream transects will be placed within the dredging TSS plume so as to remain within the central two-thirds of the plume based on the increased levels of turbidity and TSS. A boat-mounted Acoustic Doppler Current Profiler (ADCP) or continuous reading turbidity probe will be used to characterize the plume (e.g., location, width). The Phase 1 RAM QAPP will provide justification for the technique to be used to characterize the plume. In the event that the ADCP is not used or is not sufficiently sensitive to TSS conditions, the continuous reading turbidity probe will be used to vertically profile the dredge plume along each cross section. The coordinates of the end points of each transect will be established using GPS and marked using small buoys.

8.1.5 Sampling Methods

The background sample will be a single depth-integrated composite. At locations downstream of the dredging, sampling will be conducted at 0.2 and 0.8 of the water depth at each monitoring station. One sample will be collected at each location per sampling event, compositing the samples from each depth. For PCB samples, water will be pumped from these depths through an in-line filter using a peristaltic pump. The pumping rate will be set at a rate that will result in collecting approximately 8L of water over a one hour period. The sampling vessel will move back and forth laterally across the river along the transect at idle speed during sample collection. The pump intake tubing will be attached to a downrigger or similar device to maintain depth while moving. The level of the intake tubing will be adjusted as the boat is moving to compensate for significant changes in bathymetry. A second pumping system will be used concurrently to collect a sample for TSS analysis. Pumping will be temporarily suspended to allow changing of filters, as required. All of the filters used, and all of the filtrate generated, will be submitted for laboratory analysis. Upon completion of sampling at one transect, the sampling vessel will move downstream and begin sample collection at the next transect.

During the period of sampling, continuous monitoring will be performed at each sampling location for DO, conductivity, temperature, pH, particle distribution, and turbidity; these measurements will be logged at a minimum frequency of one minute. Continuous water column monitoring data will be acquired using a YSI 6000 Series multi-parameter probe, or equivalent. Continuous monitoring data will also be available from the near-field monitoring stations during each sampling event.

8.1.6 Analytical Methods

8.1.6.1 Suspended Solids

The composite water samples will be analyzed for suspended solids using EPA Method 160.2 with modifications to be consistent with American Society for Testing and Materials (ASTM) Method D 3977-97.

8.1.6.2 PCBs

The solids on the filter and the filtrate will be analyzed for PCBs using the modified Green Bay Method (mGBM) and extraction protocols used during the BMP.

8.1.6.3 Organic Carbon

The composite water samples will be analyzed for DOC using EPA Method 415.1, as described in the BMP QAPP and POC via filtration and combustion of the filtered material (Lloyd Kahn method).

8.1.7 Reporting

The procedures and schedule for reporting the results of this special study will be provided in the Phase 1 RAM QAPP.

8.2 Non-Target, Downstream Area Contamination

8.2.1 Objective

The objective of this study is to determine the extent of contamination in terms of spatial extent, concentration and mass of Tri+ PCB contamination deposited downstream from the dredged target areas in non-target areas, that is, to determine the extent to which resuspension induced by dredging activities results in the movement of PCBs to non-target areas. Such movement is expected and is of consequence if the PCB levels in the non-target areas are materially increased. Knowledge of the nature and extent of this movement and its relationship to the type of sediment being dredged, its PCB concentration, and the physical setting may provide a means to assess the need for resuspension controls to prevent the contamination of non-target areas to levels exceeding the mass per unit area (MPA) and surface Tri+ PCB concentration thresholds for dredging.

8.2.2 Study Areas

The study will be carried out at multiple locations so that a range of dredging conditions can be evaluated (e.g., different sediment types (cohesive and non-cohesive), PCB concentration ranges, and the range of dredge types expected to be selected in the Final Design Reports). Three locations have been chosen and are: 1) a location within transitional sediments in NTIP (Location 1 in Table A8-1 and on Figure A8-1); 2) a location within sandy sediments in NTIP (Location 3 in Table A8-1 and on Figure A8-1); and 3) a location within fine sediments in EGIA (Location 5 on Table A8-1 and Figure A8-2).

8.2.3 Monitoring Frequency and Duration

The monitoring period for each study area will extend over the entire time that the study area is being dredged, which will likely be a period of several weeks. Obtaining useful data will be complicated due to changes in the location of the dredging activity in relation to the sampling locations (i.e., to the extent that the distances between the sampling points and the dredging activities vary, it will be difficult to interpret the data). Six rounds of data will be obtained at approximately equal time intervals. The length of these time intervals will be determined by subdividing the estimated time required to dredge the target area by 6. Time intervals are anticipated to be between a few days to a few weeks depending on dredging productivity. The frequency of monitoring may be adjusted during the study to reflect actual dredging progress. At a minimum, the study will consist of approximately 3 weeks per study area unless dredging in a study area is less than 3 weeks in duration. No sampling interval will be less than 3 days to avoid obtaining non-detect results.

8.2.4 Monitoring Stations

Stations will be located within an area extending not more than 300 m downstream of the dredging activity. Because substantial lateral gradients in deposition are expected due to the distribution of TSS in the resuspension plume, stations will be located along transects perpendicular to the plume. Five stations about 15 m apart will be located on each of the first 3 transects. Transects will be set at nominal distances of 15m, 30 m, and 100 m. downstream of the furthest downstream extent of the dredging within the targeted area. Two additional sampling nodes will be placed 300 m downstream, 15 m to either side of the assumed centerline of the plume. The coordinates of the station locations will be established using GPS.

Initially, the locations of these transects will be much further from the dredge than the distances specified above (assuming that the dredging will proceed from upstream to downstream.). Tracking of the dredge position and measuring the accumulation of sediment at the downstream monitoring stations on a temporal basis will provide data to perform an analysis of sediment deposition characteristics for distances greater than 300 m. As the dredging operation approaches the downstream end of the dredge area, data will be obtained at the proper distances to assess the modeling results.

8.2.5 Sampling Methods

Sediment deposition will be monitored by deploying sediment traps at the stations described above. The final design and deployment procedures for the sediment traps will be defined in the RAM QAPP. The sediment traps will be deployed in pairs. Sediment mass will be measured in one of the two traps at each monitoring time interval (primary trap), and redeployed. The secondary traps in each pair will be retrieved upon the completion of the dredging in the target area upstream of the study area. The mass and PCB concentration of the sediment collected in the secondary traps will be measured.

The sediment samples will be removed from the traps by decanting water that overlies the sediment that has accumulated to the extent possible without losing solids. The remaining water and sediment will be poured from the trap into a collection vessel; the traps will then be rinsed with distilled water and the rinsate also placed in the collection vessel. After rinsing, the primary traps will be redeployed.

8.2.6 Analytical Methods

8.2.6.1 Mass of Solids

The mass of solids that is captured in the sediment traps will be determined by filtering, drying, and then reweighing the sample. The specific method will be presented in the Phase 1 RAM QAPP.

8.2.6.2 PCBs

The sediments collected from the traps will be analyzed for Aroclor-based PCBs using Method GEHR8082, with the same target reporting limit and MDL specified in Section 3.4 above. The PCB Aroclor data will be converted from total PCBs to Tri+ PCBs using the EPA-approved regression model to be developed in accordance with Section 3.4; and the results will be reported as Tri+ PCBs.

8.2.6.3 Organic Carbon

The sediments collected from the traps will be analyzed for POC using the Lloyd Kahn method.

8.2.7 Reporting

The procedures and schedule for reporting the results of this special study will be provided in the Phase 1 RAM QAPP.

9. References

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Figures

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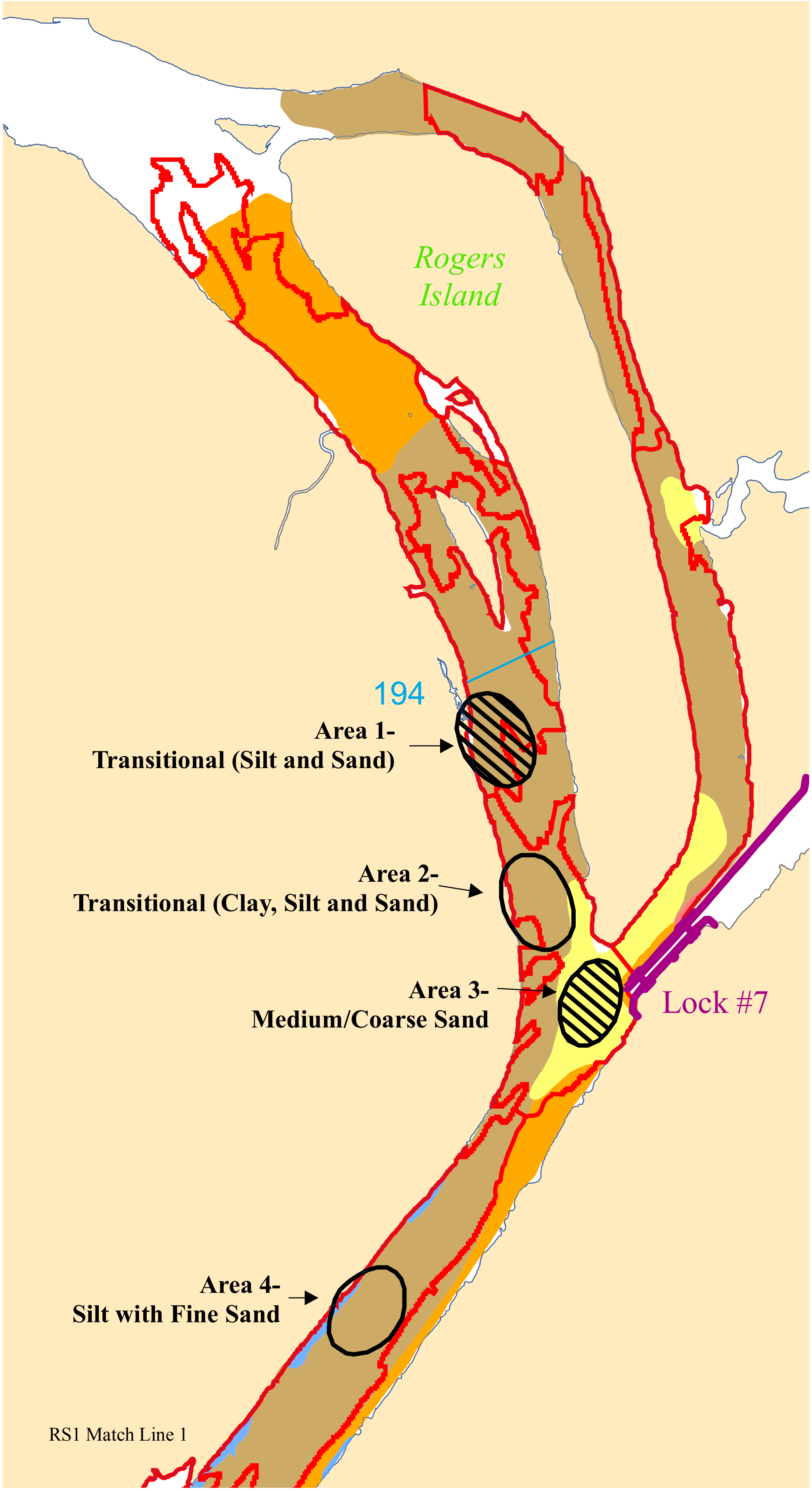
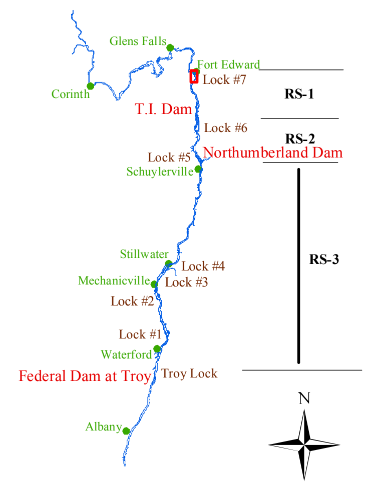
engineers, scientists, economists



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

0 250 500 Feet

LEGEND

- Dams and Locks
- River Miles
- Shore Line
- Land

Dredge Areas

- Phase 1 Dredge Areas
- Preliminary Phase 2 Dredge Areas

Special Studies

- Near-Field PCB Release Mechanism Study Areas
- Near-Field PCB Release Mechanism and Non-Target, Downstream Area Contamination Study Areas

Sediment Type

- Type I
- Type II
- Type III
- Type IV
- Type V

FIGURE A8-1

Proposed locations for special studies in NTIP.

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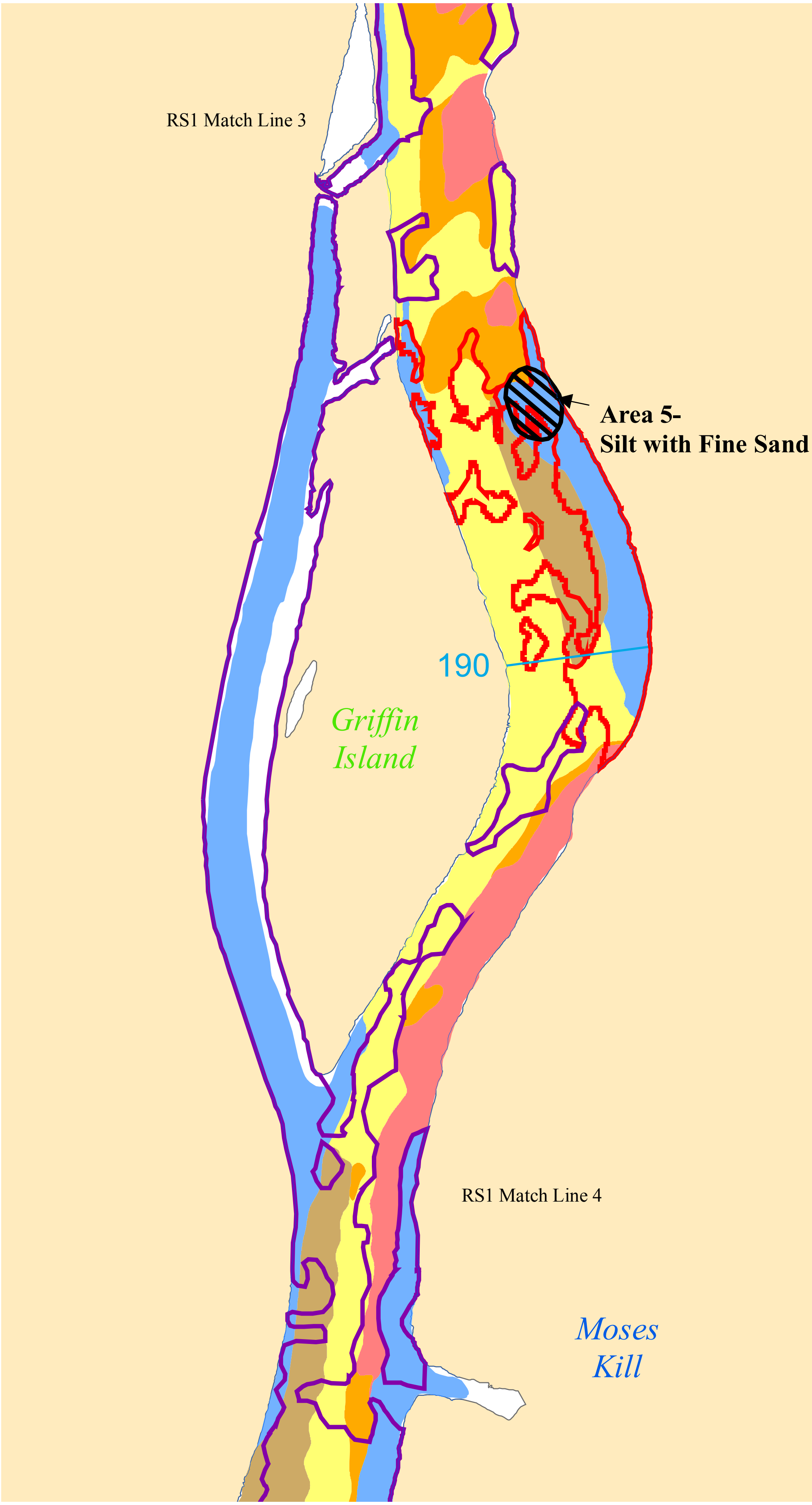
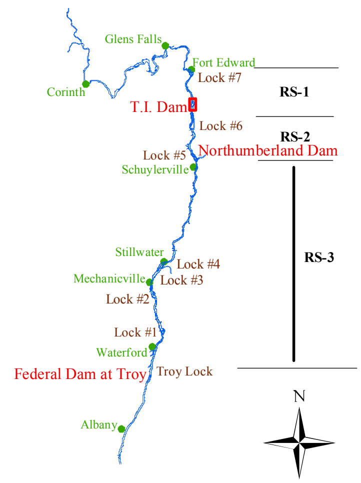


LOCATOR MAP OF THE UPPER HUDSON RIVER



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Special Studies

- Near-Field PCB Release Mechanism Study Areas
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Sediment Type

- Type I
- Type II
- Type III
- Type IV
- Type V

FIGURE A8-2

Proposed locations for special studies in EGIA.

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